Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT

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General View of Pacific Mills, Ltd., Ocean Falls, B. C., Showing Power House, Paper Mill, Pulp Mills and Saw Mill.

Hydroelectric Plant and Paper Mill at Ocean Falls, B. C.

Interesting Features in the Canadian Properties of the Pacific Mills, Ltd.—Power Generated from Hydroelectric Plant—Unique Electric Drive of Large Paper Machines

By W. A. SCOTT

THE paper manufacturing industry in the Pacific Northwest has grown to important proportions within the last ten years. It is represented by four mills in Oregon, five in Washington, and four in British Columbia. Four plants of the larger capacity are those of the Crown Willamette Paper Co., at West Linn, Ore., and Camas, Wash., and the Powell River and Ocean Falls mills in British Columbia. The Crown Willamette mills at West Linn have a capacity of 400,000 lbs. of paper per day, that of the Camas mills being about 350,000 lbs.

Other smaller, but successful, plants are operated at Oregon City, Lebanon and Astoria, Ore., and at Spokane, Everett, Steilacoom and Port Angeles, Wash., while on the Canadian side there are two other mills and a sulphate plant in operation, in addition to the larger mills referred to. There is a new mill under construction at Salem, Ore., which will be completed within a short time.

All the larger mills use wood in the manufacture of paper, which involves logging and saw-mill operations. The woods mostly used consist of spruce and hemlock, of which the culls and lower grades are selected. While sound timber is required, it may be stated that the pulp and paper manufacturer consumes a good part of that which is rejected by the manufacturer of the first-grade lumber of commerce. The industry is one requiring a heavy consumption of electric and steam power, and provision for an abundant water supply.

Power Plant and Mill at Ocean Falls.

The plant at Ocean Falls, B. C., which was completed late in 1917, is the property of the Pacific Mills,

Ltd., and undoubtedly exemplifies the most modern development in paper manufacturing in the Northwest. It consists of hydroelectric and steam-power equipment, paper and pulp mills, with sulphite and sulphate departments, a sawmill, and facilities on the townsite for housing 500 employes. This plant has a producing capacity of close to 200 tons of paper per day, of which about 140 tons consists of news print, the rest being mostly a kraft wrapping paper made from sulphate pulp.

Ocean Falls is situated on the British Columbia coast, about 380 miles north of Vancouver, and depends wholly upon water transportation for receiving supplies and the shipment of its products. Closely accessible are vast forests of spruce and hemlock. The plant was built on a stream that flows into Cousin's inlet from a lake that is situated upon a higher bench farther east.

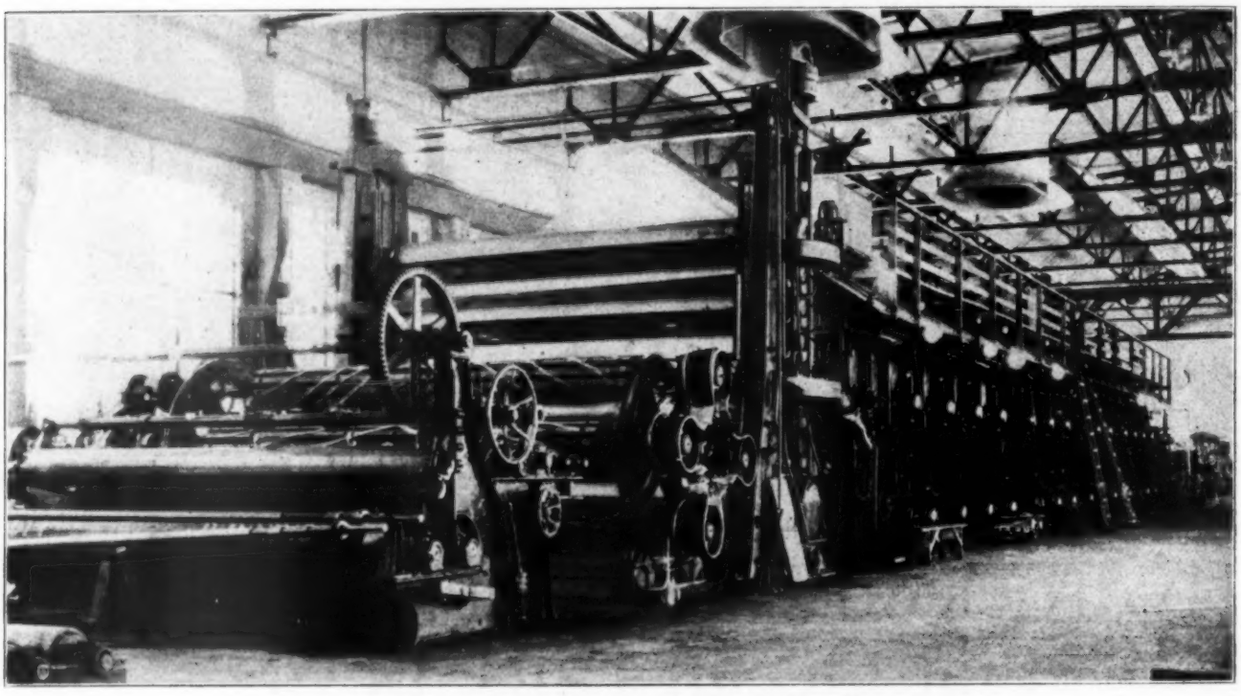
There was an original plant here which was acquired by Pacific Mills, Ltd. It consists of a small hydroelectric development, a saw-mill and a groundwood pulp mill that was operated to utilize the sawmill refuse. The original hydroelectric units were retained intact and they became a part of the larger plant subsequently built by Pacific Mills, Ltd.

The equipment of the old hydroelectric plant consists of three Westinghouse 600-kw., 440-volt generators with which the Francis type of water turbines are used, all operating under a 110-ft. head from penstocks that lead from the original dam. This system of 440-volt energy is tied in with the new 2300-volt system through a bank of transformers by which 2300-volt current is delivered. The 440-volt motors of the original pulp mill, however, were retained and are still in use.

New Hydroelectric Plant.

Construction of the new power plant involved the building of a concrete dam, 650 ft. long and 50 ft. high, giving an average head of 140 ft. at the turbines. It also involved the construction of a reinforced-concrete power house for housing the three new generating units, consisting of two Canadian General Electric 1850-kv-a., 2300-volt generators, each direct-connected to a Pelton waterwheel of the speed of 225 r.p.m.; also, a 3750-kv-a., 2300-volt generator of same make, but driven by a Pelton wheel of the speed of 350 r.p.m. Provision is made in the building for an additional 3750-kv-a. unit. The generators in the new power house are served by a penstock of 12-ft. diameter and approximately 800 ft. long. The three generators in the old power house and six water turbines which drive grinders are served by another penstock 1000 ft. long.

The new paper mill is of reinforced-concrete construction. It houses four paper machines and other accessory equipment. These consist of two 204-in. Bagley & Sewell news machines, a 174-in. machine of same make for producing kraft paper, and a smaller machine of 122-in. size. Within the same building is the sulphite mill for producing pulp from which kraft paper is made. The mill structure, power house and other buildings rest upon foundations of cluster piling, capped at the water-line with heavy concrete blocks.

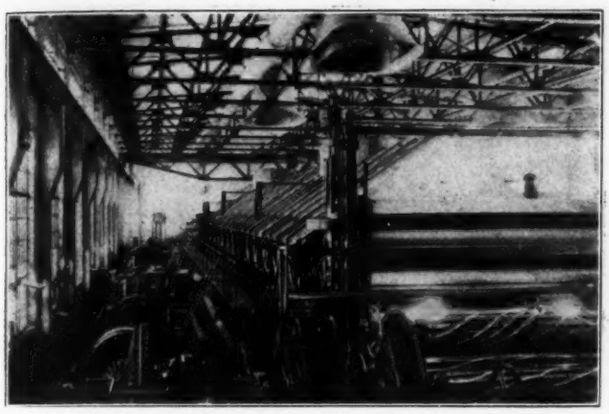


Front of 174-in. Paper Machine, Driven by 600-hp. Motor.

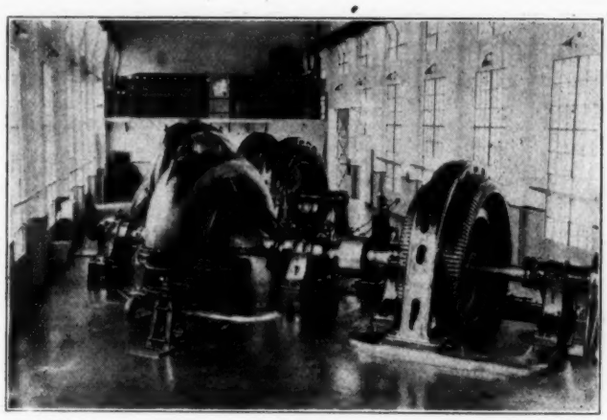
Feeder cables from the power house are carried overhead to the main group of mill buildings, and at this point lead-covered distributing cables are run in conduit. The main feeders, which consist of two three-conductor cables, of 350,000 cir. mil. area, run in parallel, lead to buses in distributing boards from which the circuits to the individual motors are run, each circuit where it leaves the distributing board being protected by a Canadian General Electric K-20 oil switch, equipped with overload protection. At the motors this oil switch, with ammeter in the cover, is cut in the line ahead of the compensator, or the drum controller in the case of wound-rotor motors.

Features of the Motor Drive.

This plant has a total connected motor load of approximately 10,000 hp., the motors varying in size



Driving Side of 174-in. Paper Machine.



View of Power Plant, Showing New Units and Switchboard.

from a 725-hp. synchronous motor down to fractional horsepower motors at low voltage. Practically all of the motor equipment is alternating-current type, except the motors on the roll grinder and the direct-current motors on two of the paper machines, namely, the 174-in. machine and the 122-in. machine, on which the kraft papers are made. These two machines are equipped with Canadian Westinghouse full automatic variable-speed drive, having a 7-to-1 speed ratio. This drive on the 174-in. machine is considered the largest drive of the kind in the world.

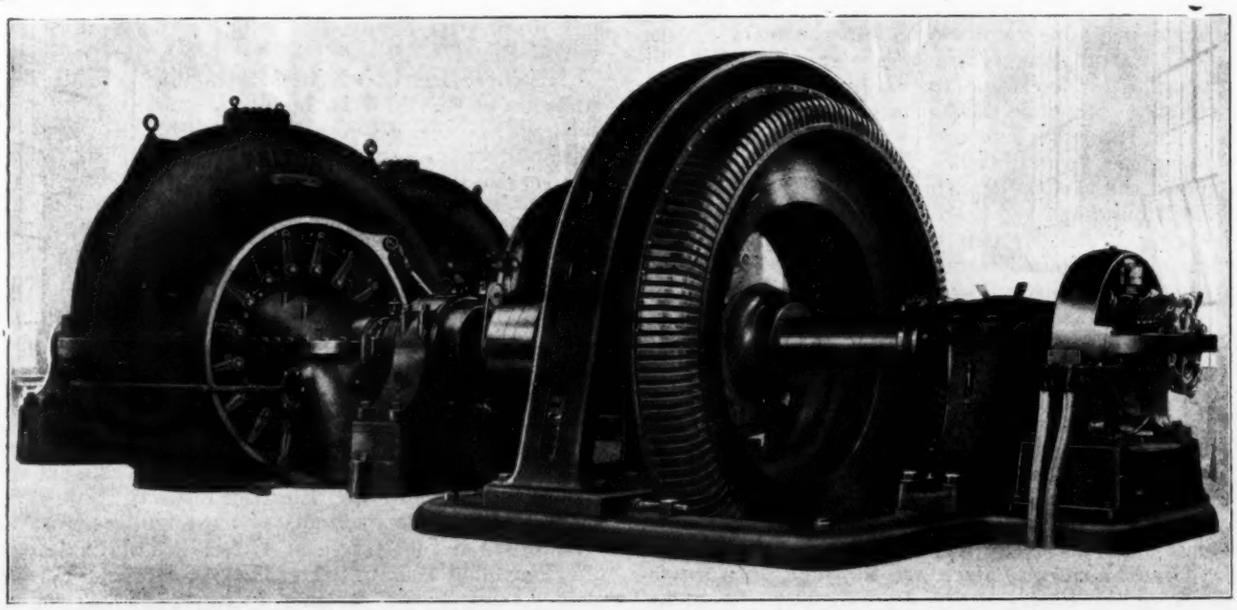
It consists of a 600-hp., variable-speed direct-current motor, direct-connected to the lineshaft, this motor having a speed range from 50 to 350 r.p.m. The direct-current supply for this motor is furnished by a motor-generator set driven by a 725-hp., 2300-volt synchronous motor. Automatic push-button control is obtained by the use of a Westinghouse control panel provided with start and stop contactors, and a motor-operated speed-controlling rheostat, which automatically varies the field excitation of the generator, as well as that of the motor, so as to obtain the total speed range of from 50 to 350 r.p.m. A motor-generator set was used for obtaining the direct current, in view of the fact that steam turbines could not be procured at the time that this installation was being put in.

On the 122-in. kraft machine there is a similar automatic speed control, the direct-current motor of which has a rating of 400 hp. This motor is also direct-connected to the variable-speed lineshaft of the machine and has the same speed range as the larger unit.

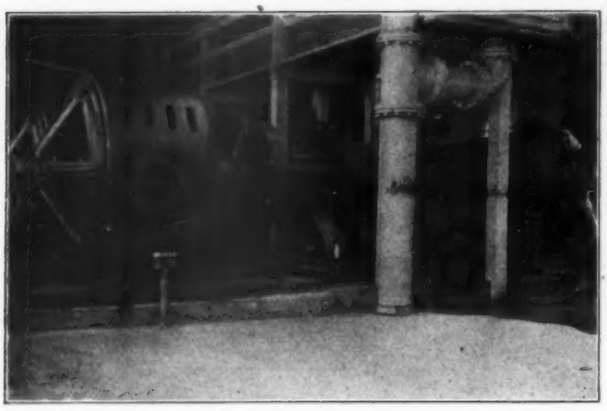
Other interesting motor applications about the plant are the use of 300-hp., 2300-volt, direct-connected motors for paper-machine jordans. These motors are mounted on the same base with the jordan, and are arranged so that the whole motor can move lengthwise of the base along with the jordan plug, as this plug is screwed in or out of its shell. There are three of these jordans on each of the kraft machines and two on each of the 204-in. news machines.

In the beater room the lineshafts are operated by 350-hp., 2300-volt motors, direct-connected to the line, these motors being of wound-rotor type, on account of the better starting characteristics.

Larger sizes of centrifugal pumps about the plant, used for handling white water, together with groundwood sulphite and sulphate pulp, are driven by direct-connected motors in sizes from 50 to 75 hp., at 900 r.p.m., these pumps being of the paper mill's own design, providing a high-speed, high-efficiency pump, and having ready means for cleaning and unrestricted



Pelton Water Wheel Driving Canadian General Electric 3750-kv -a., 2300-volt at 350 r.p.m. at Plant of Pacific Mills, Ltd., Ocean Falls, B. C.



Motor-Generator Set, the Driving Unit of Which Is a 725-hp. Synchronous Motor.

Three 300-hp., 2300-volt Motors Direct Connected to Paper Machine Jordans.

passages through the pump in order to reduce to a minimum the liability for stoppages when handling pulp.

STEAM-BOILER PLANT.

In addition to the extensive electrical equipment, a modern paper mill requires a large steam power plant, the steam being used in the cooking operations incidental to the manufacture of sulphite and sulphate pulp and for the drying of the paper on the steam-heated dryer rolls of the paper machines.

At Ocean Falls there is a total of about 4500 boiler horsepower installed, twelve of the units being 150-hp. return-tubular boilers, which were a part of the original installation, the new units being 500-hp. units of Badenhausen and Babcock & Wilcox make. Oil fuel is burned in the paper-mill boiler house, while at the sawmill boiler house mill refuse is burned. There is some surplus steam at this house, to take advantage of which a steam line approximately 1800 ft. long is run from the sawmill boiler house to that of the paper mill. This boiler plant was originally laid out so that coal could be burned if necessary, and during the war emergency the prospect of not getting fuel oil became so serious that equipment was bought and installed to enable this plant to burn coal.

This boiler plant is equipped with a 200-ft., 12-ft. diameter Custodis radial-brick stack. All the new boilers are equipped with Foster superheaters. Steam-metering arrangements are very complete, so that it is possible to determine the steam usage in all departments. Republic flow meters of the long-distance electrical recording type are installed so that the chief engineer can, from his office, tell at any time the steam usage of the various departments.

Mill buildings are heated by a hot-air system, the air being heated at two central heating points and warm air distributed throughout the mill buildings in large galvanized-iron ducts.

ELECTRIC TRUCKS MAKE LONG TRIPS TO REACH NEW YORK SHOW.

One from Philadelphia, the Other from Danbury, Conn. Make Journey Under Own Power—Practicability of Electrics Demonstrated.

Two electric trucks which are attracting unusual attention at the New York Electrical Exposition at the Grand Central Palace are the high-pressure fire engine of the Paterson (N. J.) Fire Department and a five-ton vehicle which has been purchased by a concern in Norway. As soon as the show closes the one will go into active fire service and the other will be shipped abroad.

These two trucks were run from their respective factories to New York under their own power, the fire engine covering 90 miles from Philadelphia while the vehicle for Norway made the 69-mile run from Danbury, Conn.

The fire engine is of the high-pressure type and was purchased by the City of Paterson after tests which included speed, hill climbing, speed out of the station, mileage, and general dependability. It is the twenty-first electric that the New Jersey municipality has added to its fire-fighting fleet. The engine is equipped with a chemical tank, carries a complement of ladders, has high-pressure connections and the necessary hose and mounts a searchlight on the dash. Taken all in all it is a combination engine, chemical wagon, hose cart, ladder truck, and searchlight wagon —practically a whole department in itself. It derives its power from an 80-cell battery, and is driven by four powerful motors, one on each wheel. It has a speed of 22 miles an hour and made the trip from Philadelphia at an average speed of 12 miles per hour with two battery boosts, one at Trenton and one at New Brunswick.

The export truck is a five-ton standard chassis. It left Danbury in the morning and reached New York at 4 p. m. after having had a battery boost at Stamford, Conn.

Another electric which is attracting considerable attention at the show is the 15-year old veteran of a department-store delivery fleet. With the exception of minor replacements, it is the same vehicle that went into service in 1904.

AMERICAN ELECTRIC RAILWAY ASSOCIATION TO CONVENE.

The thirty-eighth annual convention of the American Electric Railway Association will be held at Atlantic City Oct. 6-10. The program includes addresses and discussion on the following subjects: "The Public Service Railway Co.'s Zone System," "What Must Be Done with the Electric Railways Before They Can Again Find a Market for Their Securities?" "Labor and the Electric Railway Industry," "The Relationship of Items of Cost Under Pre-War Conditions and Today; Can These Be Collected from the Traveling Public? Are They to Develop Permanent Competition?" "Some Features of Service-at-Cost Plans," and reports of committees on valuation, zone systems and federal investigation.

Central-Station Rates in Theory and Practice

Thirteenth Article—Differentiating Between Classes of Service —Value of Service According to Size of Customers and Use— Isolated Plants and Other Competition in Light, Power and Heat

By H. E. EISENMENGER

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This is the thirteenth article of this series, which began in the issue of July 12. Part I consisted of seven articles on the cost of electric service. Part II, which is concluded this week, consists of six articles dealing with the general policy that is to influence selection and preparation of a rate system suitable as to the relative profit contributed by different classes of customers. In Part III, to begin next week, will be taken up consideration of different systems of rates. Other future parts of the series will discuss rate analysis, accuracy of rates, regulation and related topics, the articles continuing throughout the remainder of the volume.

PART II—THE PRICE OF ELECTRIC SERVICE—Continued.

III.—The Value-of-Service Principle (Continued).

C. Application to Individual Customers and to Classes of Customers.

SECTION 95. Now obviously we cannot shade prices for each individual customer by determining or estimating the monetary value he attaches to the respective part of a service. This method of applying the value-of-service principle between individual customers is generally considered unfair in commercial practice[1] and respectable retail merchants, for instance, charge the same price for certain goods on a certain day for all customers without exception.[2] Discrimination between individual customers is forbidden to public service corporations by the public utility commissions.

But we can and should make our prices so that different percentage profits are obtained from different *classes* of customers and from different *kinds* of goods or *classes* of service. This kind of differentiation or "discrimination" is recognized as perfectly legitimate by the public utilities commissions and is also probably felt as being fair by the majority of the general public. It is, in fact, fairer than the apparent lack of discrimination, as expressed by charging equal percentages of profit from everybody, whether rich or poor (cost-of-service principle).

In practice we apply the *value-of-service principle* between classes of customers and classes of goods, whereas the strict *cost-of-service principle* is applied to the customers and goods within each class.

As an example of the differentiation of profits between classes of *customers* remember the regular "sales" in department stores on certain *days* of the week. On these days extra low prices or extra high discounts ("double stamp days") are allowed which apply chiefly to those classes of customers to whom the difference in price is important enough so that they are willing to take upon themselves the inconvenience of planning their shopping and delaying their purchases until that particular day arrives, and then of shopping in the crowd. The excursion and holiday rates on railways, etc., are a similar example.

As regards the differentiation between classes of the *commodity* or service we have a well-known example in the discrimination of the post-office charges between letters and printed matter ("first class," "second class" and "third class" mail). It costs the Post Office Department practically the same to transport and deliver a sealed written letter as it costs for printed matter of the same weight from the same sender to the same addressee and yet the charges are 3 to 12 times as high. The chief reason is that senders of a "first-class" letter are able and willing to pay the higher charges, whereas only a small percentage of the newspapers, printed advertising circulars, etc., which are now being sent by mail would be transported that way if the charges were raised to the same amount as the first-class letters, or even to the average between the first, second and third classes. Another example of discrimination between classes of commodities is furnished by the price reduction to every customer (in sales or permanently) of certain *goods* in department stores and other stores (which is not identical with the reduced prices on certain days mentioned above) when it is found out that these goods are not selling rapidly enough.

D. The Value-of-Service Principle in Central-Station Service.

1. General Principles.

96. In determining the cost of central-station service we have found (see Section 10 et seq.) that the cost of production of service consists of three separate items. The lowering or raising, respectively, of the profits from different customers as required by the value-of-service principle should therefore apply theoretically to every one of these three items of cost. We have seen, however, (see Section 57) that the customer cost is of importance only with the smaller customers and is negligible with the large and even with the medium-sized customers. We might there-

[1] There are exceptions, however. For instance, the practice of physicians to make lower charges (or none at all) to indigent people and to indemnify themselves for their time from the pocketbooks of their wealthier patients, is generally not objected against. The amounts expected from the individual as contributions towards charitable and other public purposes (also tips) which, although supposedly voluntary contributions, still frequently are collected and given under a certain pressure, are also in proportion to the individual contributor's assumed financial standing.

[2] The orient has different ideas on this subject. Haggling may go on for hours until the proper adjustment is found between the respective customer's valuation of the goods and his valuation of his money, and this is considered perfectly correct.

fore determine the customer charge of the rate by adding the profit to be collected from the small customers and apply it to all sizes of customers alike.

It will be shown, however, (Part III) that the rates generally do not follow the three-charge system inasmuch as the customer charge is frequently left out altogether. Not even the two-charge system (energy charge and demand charge) is universal, though it is applied in the great majority of rates. We come to the conclusion, therefore, that an exact mathematical application of the value-of-service principle is not feasible—even if we could have the exact foundations for the same in the form of exact data of the valuation of the service on the part of the various customers or classes of customers. We will, in general, have to be satisfied with selecting those of the three charges as we choose to embody in the rates, at such amounts that the average profit is larger or smaller according to what the following investigations (Section 97 et seq.) will show to be desirable.

As the principle of differentiating the percentages of profit refers to classes of consumers or service only and not to individual consumers, the prices must be laid down in hard and fast rules in schedules which leave no room for personal interpretation or for preference to individual customers. If, for instance, we find that the electric light company ought to draw a smaller profit from residential consumers than from commercial lighting consumers (see later, Sections 97 and 98) we will have to have one schedule for residential consumers and another one for commercial lighting.

As regards the raising or lowering of the profits for different classes of consumers and classes of service in the central-station business, we will have to be guided by the same two factors which have previously been mentioned (see Section 94) as being determinative for that discrimination in general business, viz.: (a) the customer's valuation of the service he receives, (b) the customer's valuation of the money he has to give in return for the service. These two factors do not necessarily work in the same direction, one factor may indicate a lowering of the profit to a certain class, the other one a raise.

The classification of the customers for a rate diversification in general and for application of the value-of-service principle in particular is made under two main headings, the "size" of the consumer and the purpose to which electricity is being put. The size of the customer is usually determined by the number of kilowatt-hours consumed per month or sometimes by his maximum demand, or by both. The schedules distinguish accordingly wholesale and retail customers, or the character of the business as such brings the respective customer under a certain class of size. For instance, residential customers are naturally small customers, street railways large ones.

2. Classification According to the Size of the Consumer.

a. The Small Consumers.

97. The smallest consumers generally value their dollar higher than the medium-sized and large customers and therefore we must be satisfied with a smaller profit from the smallest customers, otherwise they will turn to other illuminants. This does *not* mean that we will have to charge them lower average *prices* per kilowatt-hour, since the *cost* per kilowatt-hour is very much higher for this class of customers, chiefly on account of the "customer cost" (see Section 57).

b. The Medium-Sized Consumers.

98. Calling medium-sized consumers such consumers as have a connected load somewhere between 5 and 10 kw. as a lower limit and perhaps 30 to 50 kw. as the upper limit, such as medium-sized stores, restaurants, small factories, etc., we find that we cannot claim any special reason why this class should pay especially low profits, whereas such reasons do exist for the small and the large consumer. (See Sections 97 and 99.) The natural inference is that this class of customers must pay a larger profit than the average.

Let it be emphasized again that charging prices to the medium-sized customer which involve higher profits than the average will be of advantage not only to the electric light company, but also to the community of electric light users, possibly including the medium-sized customers themselves. The higher profits from the medium-sized customers do not necessarily mean that these customers have to pay for the others. If we would not grant prices with lower profits to the other customers, for instance the small ones, they would drop out and the profit derived from them would be lost. The prices to the remaining, that is the medium-sized, customers would have to be raised because the cost would have to be so much higher owing to the reduced size of the plant.

c. The Large Consumers—Central Station vs. Isolated Plant.

99. Proceeding now to the third class, the large consumers (for instance, large hotels, department stores, office buildings, theaters, etc.) we find that they too like many medium-sized customers would have to use electricity as a matter of necessity, but here another element enters in. The large consumer is in a position to build his own generating plant and under certain conditions may be able to generate his electricity cheaper than what the electric light company would charge him if it applied average profits in making his prices.

The selling price of the service from the central station is therefore in competition with the output cost of the service from the isolated power plant. This is not *necessarily* a disadvantage to the central station, but it may be so. The central station has the advantage of the bigger plant, which reduces the operating expenses per kilowatt-hour and the capital invested per kilowatt capacity of the power station. The central station further has the big advantage of a diversity-factor larger than unity, which means, as we have seen in Section 45, it can use the same kilowatt of power-house capacity several times over for different customers, one after the other. Also the reserve capacity of the isolated plant is generally a larger percentage.[3]

[3] To illustrate these points: If the isolated plant has a peak load of 1000 kw. we would have to install perhaps two 500-kw. generators to carry the load, whereas if we supplant the service from the isolated plant by central-station service the central station will have to increase its capacity for that purpose by perhaps only 700 or 500 kw. or less, according to the size of the diversity-factor, so that the capital invested per kilowatt of maximum demand is so much smaller. These 500 or 700 kw. are not furnished from 500-kw. generators but from large ones of 5000 or 10,000 or more kw.; this means the capital per kilowatt capacity is still further reduced in case of the central station. Moreover, if the isolated plant is to furnish the service, we will have to install a third generator of 500 kw. there as a reserve for breakdowns, that is 50% of the total capacity, whereas in the central station, where we have a larger number of generators, the size of the reserve generator is a smaller percentage of the total capacity. If we have, for instance, five large generators of 10,000 kw. each, installed in the central station for regular service, the sixth unit of the same size, installed as reserve, will be but 20% of the capacity. (Of course, we might also subdivide the 1000 kw. of the isolated plant into five units of 200 kw. each with a sixth one in reserve, but this would not only fail to bring about a reduction of the capital cost but would also increase the operating cost.)

The difference in the quality of service should not be forgotten in this connection. In many of the hotels and other places which are still operating an isolated plant we can, for instance, notice a rhythmical flicker of the electric light, which is not only annoying, but also very injurious to the eyes.

These are the chief (but not all) of the advantages of the central station over the isolated plant. On the other hand, the isolated plant has a number of economic advantages over the central station. It is not burdened with a high-voltage transmission and a distribution system since the house wiring generally is connected directly to the power-plant switchboard. The advantage sometimes quoted that the isolated plant can in winter be run with the steam from the heating system of the building and with the attendance provided for the heating plant is of questionable nature, since both heating steam and labor are inferior to that desirable for operating a good electric plant.

The question of the relative cost of providing electric power from the central station or from an isolated plant involves too many factors to permit of a general answer which applies to every individual case. But the scrapping of existing isolating plants in favor of central-station service is a frequent occurrence, whereas the opposite is rarely, if ever, heard of in the territory of supply of a well managed central station. This demonstrates that the central station generally has the economic advantage over the isolated plant. This is the consequence of the progress of the central-station business, chiefly of the accomplishments of recent years in filling in the valleys of the central-station load curve, thereby increasing the load-factor and the diversity-factor, and it is also the consequence of the progress made in central-station rates, chiefly brought about by the clear recognition of the value-of-service principle, particularly in its application to the large consumer.

The relative merits of the central station and the isolated plant to the public are clearly brought out to the engineer if he considers the following hypothetical problem: What would we do if we had to supply most economically a large city, where electricity was hitherto unknown, with light and power on a large scale? It would certainly be very, very unusual conditions which would bring the construction of isolated plants even within consideration.

3. *Classification According to the Purpose for Which Electricity Is Being Used.*

100. Whereas we have thus to discriminate between the different sizes of the customers in the application of the value-of-service principle, we must also, according to Section 96, pay due regard in this connection to the purpose for which electricity is being used.

The main uses to which electric central-station service can be put are (a) lighting, (b) motor service[4] and (c) heating[5].

The value-of-service principle requires that the price of electric service be in general not essentially higher than the price of competitive service (competitive sources of illumination, power and heat) because the customer's valuation of the service is largely determined, or rather limited, by the amount of money for which he can get a similar service from other sources. But considering the convenience, cleanliness, relative fire-safety and other advantages of the electric service its price may in many cases be somewhat higher than that of competitive service.

In the following an investigation is attempted of how the valuations of the three main services (light, power and heating) compare with each other.

101. Electricity for power will be valued slightly lower than electricity for light, at least in case of consumers who are not among the smallest. We can easily understand this from the fact that if these consumers would have to make their own light or power it would cost them almost the same amount to furnish a certain load curve for power or for light. The cost for power load will be slightly smaller than for lighting load because the speed regulation need not be as close, both as regards the regulation between full load and no load (governor) and the fluctuations of speed during each revolution (flywheel). Also in those instances where for power load a purely mechanical drive is preferable over electric power transmission, that is, where we have only one power-consuming device, or a very few of them close to each other and to the prime mover, a further relative saving may be made in the generation of power vs. generation of light, because then the electric equipment becomes unnecessary and the operator need have no training in electricity. Power rates should therefore generally be calculated with the same or a slightly smaller profit than lighting rates.[6]

For very small customers who have so little demand for power that they cannot think of installing gasoline or gas engines, conditions are different. The mechanical power they require can be furnished by hand or foot and the electric motor is frequently more or less of a luxury for them (household motors, dentists' motors, etc.).

Where the motor is used as a money-earning element, for instance in workshops of small trades people, the valuation of electric power will vary between different trades with its earning power. The price of electric power will not be of such importance to the jeweler who uses it for polishing jewels as to the man who uses electric power for pumping water or crushing stones. Moreover, in one trade electric power will be more of a luxury whereas in another one it will be a necessity.

The valuation of electric light, as far as the influence of the competitive illuminants goes, will be determined by the price of gas and kerosene. The advantages of the electric light, such as convenience, cleanliness, reduction of fire hazard, absence of pollution of the air, etc., will play a greater part in the customer's valuation if he is well-to-do than if he is poorer, because a wealthier man will generally be more willing to lay out a little extra money for these advantages than the man who has to be careful how he spends his pennies.

For all these reasons no general rules can be laid down for the relative valuation of light and power for smaller consumers. But these small power users receive their power under the lighting rates anyway so that this question is not of great importance.

102. A decided difference in the valuation on the part of the customer is seen when we compare heating service with lighting (or power). This will

[4] Industrial motors, railways, elevators, refrigerating, pumping and irrigating, ventilating, motor-generators for electroplating or telephones, etc. Also battery charging for automobiles as this energy is ultimately consumed in motors.

[5] Industrial heating, such as ovens, and domestic heating, such as cooking, flatirons, radiators, etc. "Heating" may also include electric welding, also electric steel making and other electrochemical processes.

[6] Here again the reader is warned against confusing the question of profit-adding with the question of the price per kilowatt-hour. Power consumers generally are charged much lower prices per kilowatt-hour because they are long-hour users.

be understood from the following. A steam engine or steam turbine, even of the largest and most economical type, utilizes certainly not more than 20% of the heat energy generated in the boiler furnace. The remaining 80% is not converted into mechanical energy and is lost. About one-fourth or one-third of the mechanical energy at the turbine shaft is then lost in the course of converting it into electrical energy and of transforming and transmitting the same, so that even in the most economic cases certainly not more than about 12 or 15% of the energy contained in the coal arrives at the customer's installation. Further conversion from electricity into useful heat then takes place at a very high efficiency, generally near 100%.

Assuming now that a competitive direct-heating device—stove, furnace, etc.—utilizes only one-seventh of the heat contained in the coal and lets the rest escape into the flue, we can see that we use just as much coal for electric heating as for direct heating by fire. If the electric light company under these conditions would charge the heating customer nothing but the bare cost of coal, the consumer would find that the cost to him of heating from both sources is about the same.[7] Now electric heating has not only the ordinary advantages of electric service, such as convenience, etc., mentioned above several times, but also others, such as easy temperature regulation, concentration of the heat at the point where it is needed, or uniform heat distribution, as the requirements of the case may be, absence of contamination by combustion gases, possibility of reaching extremely high temperatures, etc. These advantages make electric heating superior to other methods, for instance in electric steel making. Electric heating can therefore in certain cases compete with direct heating by fire even though the price per heat unit utilized is higher. But even then the above reflections show that we have generally to be satisfied with an extra low profit on heating service if we want to get the business.

(To be continued.)

INTERESTING SAFETY EXHIBITS AT CLEVELAND SAFETY CONGRESS.

Exhibits from Far and Near—Electrical Companies Among the Many Exhibitors.

Safety exhibits from Japan, England and Canada, in addition to commercial and noncommercial exhibits from all parts of the United States, are being shown in Gray's Armory, Cleveland, Ohio, during this week in connection with the eighth annual congress of the National Safety Council.

Though the safety movement originated in England, America has made much greater progress in accident prevent work that the Britishers now acknowledge the leadership of America in this respect and are looking to this country for guidance in organized safety work.

Among the exhibits shown at the Cleveland Safety Exposition is one brought to the general office of the National Safety Council at Chicago recently by Baron K. Uchida, former governor of Formosa, Japan; this exhibit includes pamphlets, posters, bulletins, flags and other advertising matter used during Safety Week which was conducted in Tokio in June of this year almost identically along the lines of the Cleveland Safety Week. It is significant that although this was the first attempt at organized safety work in Japan, Tokio's Safety Week proved to be a "No Accident Week" in fact as well as in name. Tokio has a population of approximately 3,000,000 persons.

It is interesting to note also that the British exhibit at Cleveland defines the safety movement in the words of an American: "This is what 'Safety First,' or being careful, means . . . . and the end is, that the workman shall live to enjoy the fruits of his labor; that his mother shall have the support of his arm in her age; that his wife shall not prematurely become a widow or his children fatherless; that cripples and helpless wrecks, who were once strong men, shall no longer be a by-product of industry."

The exhibits are largely educational and include also many displays of safety devices, guards, safety inclosed switches, lighting equipment to promote safety, etc. Electrical manufacturing companies are quite well represented among the exhibitors as follows:

Benjamin Electric Manufacturing Co., Chicago.
Central Electric Co., Chicago.
General Electric Co., Schenectady, N. Y.
National Lamp Works of General Electric Co., Cleveland, Ohio.
John A. Roebling's Sons Co., Trenton, N. J.
Square D Co., Detroit, Mich.
The Buda Co., Chicago.
The Trumbull Electric Manufacturing Co., Plainsville, Conn.
Thompson Electric Co., Cleveland, Ohio.
Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

ELECTRIFICATION OF RAILWAY FROM CHRISTIANIA TO DRAMMEN.

The Norwegian Government has recently accepted the bids submitted by three Norwegian firms for the electrification of the railway from Christiania to Drammen. The three companies are: A/S Norsk Elictrisk & Brown Boveri; Norsk Maskinindustri, A/S; A/S Per Kure.

The bids include 18 normal gage electric locomotives, which are to be built at Thunes Mekaniske Verksted at Christiania. This is the first definite step to be taken in the plan for the electrification of the entire Norwegian railway system. The power is to be obtained from the Hakavik power station, which is located not far from Kongsberg, Norway, where can be produced about 25,000 hp.

POWER PLANT DEVELOPMENT ON THE RHONE RIVER PLANNED.

A scheme for the utilization of the water power of the Rhone and other rivers in central France is under consideration by the French Ministry of Public Works. A canal will be constructed which will make the Rhone navigable for ships of 1200 tons capacity from the sea to Switzerland and a number of power stations will be constructed on the river. Concessions for the development will be given to a company which is capitalized at $40,000,000. It is anticipated that 200,000 kw. of the power generated by the Rhone power stations will be supplied to the city of Paris.

[7] In hydroelectric central stations we would likewise have to charge prices with much lower profits than the average for the same reasons, because the total cost of hydroelectric service is of the same order of magnitude as steam-electric service, though the energy cost frequently is lower. Where we have generation from water power in a region where fuel is expensive, such as in certain parts of the West in the United States or in Sweden, the field for electric heating is better than where fuel is cheaper, especially where the heating load is essentially off-peak, so that the increment demand cost is zero.

Development of the Chicago Street-Lighting System

Progress Made by Chicago Department of Electricity — Metallic Flame Lamps — Installation and Operation of Series Group Systems — Paper Before International Association of Municipal Electricians

By WILLIAM G. KEITH

Commissioner of Gas and Electricity, Chicago, Ill.

DURING the year 1887 the first municipal electric light plant for lighting the city's streets was established in the basement of a fire engine house and 105 open arc lamps were placed in service on the river front and downtown streets. Each year thereafter additions were made both in lamps and equipment, until in 1897 a total of 1440 lamps operated from three stations, constituted the municipal electric light plant. This plant was operated as a bureau of the fire department.

In January, 1898, the city council created by ordinance the department of electricity. The report of the city electrician for that year shows that a total of 1710 lamps were maintained at a total cash cost of $68.52 each.

From this time on progress was made as regards extensions to the system and decreased cost of maintenance. The 1908 annual report showed a total of 8602 lamps maintained at a total cost of $45.86 per lamp. During that year the power generated by the Sanitary District at Lockport was made use of to displace the steam engines as a source of energy for street lighting. Extensive alterations were made necessary by this change and the way was opened for future extensions of a magnitude hardly thought possible before.

City Installs 10,000 Additional Lamps.

In October, 1910, a contract was made with the Sanitary District whereby it was to furnish and install on the streets of the city 10,000 arc lamps in addition to those in service at that time (approximately 12,200). They were also to build the necessary substations, conduits and pole lines and supply the energy necessary to operate the total number of lamps. The energy was to be furnished on the basis of $15 per hp-year of 4000 hrs., or ½ cent per kw-hr. In addition, the Sanitary District undertook to operate the substations and plants at a cost to the city of $1 per arc lamp per year. The reason for this last undertaking on its part was that it desired the use of the station buildings and the transmission lines to furnish electrical power and light to private consumers during the time such buildings and lines were not required for city lighting purposes.

The construction contract was mutually advantageous in that the city came into possession of an electric street-lighting system second to none in the world at a cost per lamp as low as any contracting firm could make, and the payments were so arranged that they spread over a period of seven years. The Sanitary District developed a load for the waterpower and equipment then installed and perfected their organization.

During the year 1911 the metallic flame lamp was improved and, as the most efficient source of illumination on the market, was adopted by the city for installation under the terms of the contract. At that time these lamps were the most suitable units for lighting open spaces, but the streets in residential districts with their overhanging trees made the selection of a small unit desirable. The 80-cp. incandescent lamp, operated in series circuits with armored cable laid in the parkway, made an ideal installation for this purpose.

As work on the contract progressed, the need for more lights to make an economical rearrangement of the existing lamps was made evident, and a supplemental contract similar to the original for 1000 lights was executed.

These two contracts for extending and changing the system were so worded as to be interpreted in terms of watts. Use was made of this interpretation to take advantage of the progress in the art of lamp manufacture and after approximately 10,000 flame lamps had been purchased and installed it was decided to adopt the 600-cp., 20-ampere, series, gas-filled lamp as a standard for open space lighting and continue the low candlepower units for residential streets, these units having been increased in candlepower to 100 and reduced in watts from 100 to 75.

All this required a great deal of money as well as careful engineering attention. To handle the contract obligations satisfactorily the city had to perfect an engineering organization. This force of men had to survey the city streets and definitely locate the position of each lamp. They made estimates and specifications for all the varied materials used, both in underground and aerial construction, and they compiled accurate maps and plans from which the Sanitary District did the work. While the work was in progress inspectors watched each detail and reported to their bureau chief.

Monthly reports of materials used and men employed were received by the city from the Sanitary District and these reports after being compared and checked with the inspectors' reports were approved and formed the basis on which payments were made.

To light one mile of street, using 23 flame or 600-cp. lamps, placing all wires underground, cost approximately $9000, while if the wires were placed aerially on steel poles the cost amounted to only $4000.

On some of the residence streets where the trees act as an obstruction to the light from arc lamps, the system of underground cables and tungsten lamps mounted in opalescent globes on the old gas posts has been installed. This type of construction costs $8000 per mile of street lighted, using 75 of the

tungsten lamps spaced 140 feet apart on each side of the street.

Approve Bond Issue for Lighting Extensions.

The construction work during the previous years had provided adequate illumination in most of the older parts of the city, few extensions having been made in the newer parts of the city. It was necessary to do this because the system had not kept pace with the increasing need. The demands of the outlying districts for increased illumination were now to be met. To do this the voters, in June, 1916, approved a bond issue of $3,750,000. South Chicago, Englewood, Grand Crossing, Roseland, West Pullman and the Northwest Side north of Diversey avenue were still in comparative darkness and it was in these sections of the city that most of the proposed lights were to be placed.

The value of street lighting as a municipal asset is no longer questioned. Adequate lighting is necessary for the protection and convenience of citizens. Without it no city can attain the highest degree of success. That lights are needed is evidenced by the number of complaints which reach the department daily. In most cases little relief has been given because of the lack of facilities for operation and because of the insufficiency of funds for construction and operation.

An engineering survey of the city was made and it was decided to place low candlepower lights in residential districts mounted approximately 10 ft. above the street level. On those streets used by car lines and for fast moving vehicles, a 600-cp. unit mounted 22 ft. above the street was selected.

In all previous installations of low candlepower lamps a series circuit connecting over 200 of the lamps was laid from lamp to lamp in the parkways. Each lamp was in direct contact with the high-tension source of energy.

Installation of Series Group System Reduces Costs.

To continue placing high potential within reach of the public was not considered safe and to eliminate this hazard it was decided to use individual transformers at each lamp location. Further analysis showed that the placing of lamps in series groups of about 20 to the group and operating these from series transformers located in manholes would reduce the costs by over 13%. Plans were prepared to carry out the work in this way.

The typical circuit for street lighting in Chicago will consist of an impedance regulator in series with a 5050-volt, 60-cycle source of energy, and approximately 22,000 feet of underground conductor insulated for 5050-volt operation. Located in manholes central to the territory to be lighted, with their primaries in series with each other and the high-tension cable, will be series transformers of suitable capacity.

The secondary of each transformer, with a permanent connection to earth at the center of the winding, will be connected to a series circuit of approximately 3800 feet of conductor insulated for 600-volt operation. Approximately twenty 100-cp. 6.6-ampere, type "C" series lamps, equipped with 110-volt film cutouts, will be connected in series with each of these secondary circuits.

The large saving in cost over the individual transformer method is due to the use of low voltage cable in place of high voltage, and the centralizing of the transformer capacity. The transformer vaults tend to offset this saving, while labor is approximately the same, making a net saving of over 13%.

The substation transforms from 12,000-volts, 60-cycle, three-phase delta to 5050 volts to neutral, 60-cycle, three-phase Y, with neutral grounded. Group lighting circuits are run from each phase through a 6.6-ampere, constant-current impedance regulator through the series transformers and back to grounded neutral in the substation. A typical circuit consists of the following items:

(a) A source of 60-cycle, 5050-volt energy.

(b) One overload and underload automatic oil switch.

(c) One 6.6-ampere, constant-current regulator.

(d) 8000 feet No. 8 B. & S. solid copper conductor insulated with a 3/16-in. wall of saturated paper for 5000/8660-volt operation and surrounded by a 1/8-in. lead sheath.

(e) 16 (4 groups of 4) 6.6/6.6-ampere series transformers, each to operate twenty 100-cp., 6.6-ampere series type "C" lamps, in series with 3800 ft. of No. 8 B. & S. gauge solid copper conductor insulated and armored for 600-volt operation.

(f) 3000 feet (3 lengths of 1000 ft.) No. 8 B. & S. copper conductor, armored, 3/16-in. varnished cloth insulation for 5000-volt operation.

(g) 3000 feet of 5000 volt armored cable as item (f).

(h) 8000 feet of No. 8 B. & S. solid copper conductor as item (d). This conductor terminates through an air-brake switch on the grounded neutral bus.

This method of operating street lamps had never been tried on a large installation and several questions arose as to the operating difficulties that might be encountered. A thorough consideration of the subject, supplemented by tests, established the following facts:

Phenomena with Open Circuited Secondary of Series Transformer.

The first consideration is the effect on the operating circuit when from any cause the secondary circuit of any transformer opens.

Practically all the current drawn is due to resistance load, and a sine wave of e.m.f. would therefore send a sine wave of current over the circuit. In the event that one of the group transformer secondaries should open, a full 6.6-ampere sine wave current would be forced through the primary, with the result that a peaked e.m.f. wave would be induced in the secondary and impressed on the open group.

By a graphical method the magnitude of this e.m.f. has been found to be 1.95 volts per turn per sq. in. of core, and the root-mean-square value 0.568 volts per turn per sq. in. of core. As a transformer of this size will have approximately 182 turns secondary and 5¾ sq. in. of core, we can expect a maximum voltage of 2040, or a root-mean-square voltage of 595 volts to be impressed on the secondary circuit until such time as the short circuiting devices provided shall operate.

As the cables are tested for five minutes with a root-mean-square voltage of 1500 volts, or a maximum voltage of 2120 volts, there is no danger of cable failure.

To guard against this potential remaining on the secondary circuit during the period of open circuit each lamp is provided with a film cutout that will puncture and short-circuit the lamp at a potential of approxi-

mately 100 volts. In addition to this, each transformer is provided with a short-circuiting device that will operate to short-circuit the secondary when the potential reaches 400 volts. This protection is designed to operate when for any reason the secondary circuit is interrupted at some point not protected by the lamp cutouts, as, for example, a post falling and breaking the conductor.

Induction.—Tests on the cable to be used for the 5000-volt circuit show that the steel armor forms such a good path for the magnetic flux that little or no benefit can be expected by placing the sides of a circuit in the same trench, while the armor in places makes impossible the transmission of electrostatic disturbances from one cable to another.

Charging Current.—When the original series tungsten circuits were placed in service a marked difference in the value of the current at the two ends of the circuit was observed. This difference was due to a charging current combining with the line current and it was found necessary to correct the difference by inserting reactance at the point where the circuit connected to its return conductor.

A diagram of the various currents in the different parts of the proposed circuit combined in their vector relationship shows that while there is a difference in current value of 0.07 of an ampere between the two station ends of the circuit, the actual difference of current between the first and last transformers is only 0.033 of an ampere and is negligible.

Power Factor.—The transformers with their lamp load have a power-factor better than 98.5%; the cable has a power-factor of 95.8% as against 91.2 for that used in former installations. The regulator power-factor is very slow, making a combined power-factor of 81.3. The charging current combines to correct this to 89%. This is 1% better than that of straight series tungsten lighting and 1.5% better than 600-cp. series compensator circuits, and in addition has the advantage over straight series tungstens of localizing lamp outages when post failures occur.

Size of Conductors.—The wire sizes selected for the group lighting circuits were determined by equating the interest and depreciation on the cost of cable against the cost of losses when using such cable. These calculations resulted in sizes considerably smaller than the No. 8 selected, but the latter size was chosen rather than the small size for mechanical reasons.

PENETRATION OF MOISTURE IN INSULATING MATERIALS.

Many samples of standard insulating materials have been tested for penetrability of moisture. A large variation in penetration is shown. Untreated papers show immediate penetration, whereas paper impregnated with various insulating compounds, treated cloth or condensation products like bakelite micarta, show very small penetration. None of the standard insulating materials may be called moisture proof.

Where the penetration of moisture is slow, little difference is noticed whether the sheet is in contact with water or the saturated vapor. Several thicknesses of bakelite micarta were used, the penetration in this case being nearly independent of the thickness up to 1/64-in., which is 1.5×10^{-6} gms. H_2O cm.^{2} per hour. Plotting gms. H_2O against time a small rapid increase in water is first observed followed by a much longer period, with practically no increase in water (time of penetration and dependent upon thickness), and then a gradually increasing amount of water, the slope of the curve remaining almost constant, which value is representative of the rate of penetration.

Several qualitative methods were first tried: (1) Colormetrically, by placing anhyd. $CuSO_4$ or $CoCl_3$ on glass plate upon which is placed the insulating material. Wet blotting paper is weighted down upon the sample and change in color noted upon penetration. Certain dyes soluble in water may be also used with good results. (2) Electrically, by conductivity change with increase of moisture measured when insulating material is placed between Hg. surface and weak salt solution. (3) Quantitatively, by collection of moisture in P_2O_5 tube, or difference in pressure of penetration water vapor when released from liquid air trap by sensitive optical manometer method.

The method now in use may be briefly described as follows: Two 100-c.c. bulbs with stopcocks at necks and common connector for high vacuum system, each having flanged tube 1.5 cm. diameter leading from the side, are so arranged that the ground flanged surfaces fit together so that the apparatus is gas-tight. Through a ground joint in one bulb a weighed P_2O_5 tube is introduced. The opposite bulb contains a small amount of H_2O and the whole apparatus may be placed in a position so that the water will come in contact with the insulating material sheet which is held as a diaphragm between the bulb chambers. It is sometimes necessary to use rubber gaskets to make a tight joint between the sample and ground surfaces of the flanged side tubes.

The whole apparatus may be placed so that the water or water vapor in one bulb may come in contact with the diaphragm. Dry air is admitted each time a weighing is made.

Where rate of penetration of H_2O is small, and to eliminate the weighing errors, a pressure difference due to penetrated moisture is measured. In this case a trap attached to the lower end of the dry bulb is used to freeze out the penetrated water vapor. When freezing mixture is taken away the difference in pressure is measured by means of the Shrader optical manometer gage.

The above is gleaned from the September issue of the *Journal of the Franklin Institute*, in which appears at frequent intervals a number of notes from the research department of the Westinghouse Electric & Manufacturing Co.

CINCINNATI UNIVERSITY AFFILIATES WITH NATIONAL SAFETY COUNCIL.

The National Safety Council has effected an affiliation with the University of Cincinnati for the purpose of carrying out a new program of education in the field of accident prevention. It includes the establishment of an industrial medicine division at the University of Cincinnati where medical students and graduate physicians will be given special training not only in industrial medicine, but in industrial relations, including sanitation and all the fundamentals of safety work as well. The plan is being carried out jointly by the college of medicine of the University of Cincinnati and the Cincinnati local council of the National Safety Council and is said to represent the first attempt in America to train doctors for industrial work. The Cincinnati plan is an outgrowth of the call during recent years for industrial physicians.

Methods of Increasing Capacity of Existing Transmission Lines

Line Limitations—Determining Relative Costs of Increasing Capacity —Considerations Involved — Paper Before Pennsylvania Association

By E. C. STONE

Duquesne Light Co.

DURING the war the problem of increasing the capacity of existing transmission and distribution lines was one of getting the increased capacity in the shortest possible time—availability was often of more importance than cost. Now it may be assumed that the problem is one of getting the additional capacity at the least cost consistent with reliability of service. More time may be taken to get the increased capacity at a lower cost. The rapid growth of the load on central station lines has been primarily in power, so that the discussion which follows will deal particularly with three-phase power circuits.

Line Limitations.

In order to intelligently attack the problem of increased capacity of existing lines, the factors which limit this capacity must first be studied. The carrying capacity of a given line is limited by

(*a*) Maximum number of amperes it can carry as determined by heating, voltage regulation or economy of operation.

(*b*) Maximum voltage at which it can be operated as determined by insulation.

(*c*) Power factor of load carried.

Since the power delivered by a line depends entirely on these three factors, it is obvious that the capacity of a line can be increased only by increasing one or more of these factors.

Increase in current carrying capacity is accomplished by increasing the line copper—the physical limitation being the weight of copper which the poles can carry. Increase in line voltage is accomplished by increasing the size of the insulators and if a great increase in voltage is made, by providing greater spacing between line wires. The limitations encountered are usually the practical ones of insufficient clearances along rights of way, municipal regulations and the like. Increase in power factor will be discussed in a later paragraph.

In a given case the factors which are to be increased—current, voltage or power factor—will be largely determined by the total cost involved. The subject of voltage regulation, however, should be very carefully considered in this connection. Voltage regulation is a quality of electric power service and must be maintained good at all times. Motors and other apparatus utilizing electric power, especially control equipment, will not operate satisfactorily over too wide a range of voltage; in fact, the lack of good voltage regulation is one of the commonest faults of electric service and is particularly annoying to the power user, because it reduces the torque which his motor can develop at just the time when he needs the greatest torque. In some cases when the line voltage is too low for the loads and distances involved, voltage regulation even limits the carrying capacity of a line to a current below that which the legitimate limits of heating or economy of operation would allow it to carry.

In Fig. 1 are shown the approximate relations between line capacity, costs and voltage regulation when increased capacity is obtained by increasing the copper and by increasing the insulation. The enormous difference of the cost of securing increased capacity of the line only by these two methods is vividly brought out. It will be seen that improvement in regulation by increasing line copper is prohibitive because of the enormous cost, but improvement in line regulation by raising the voltage usually brings an actual reduction in cost, for ordinarily when the regulation is excessive, a raise in voltage will mean material reduction in total distribution cost. In a general way, voltage regulation is not only a criterion of service but is also a criterion of line cost, and when it becomes excessive, it is pretty safe to say that money

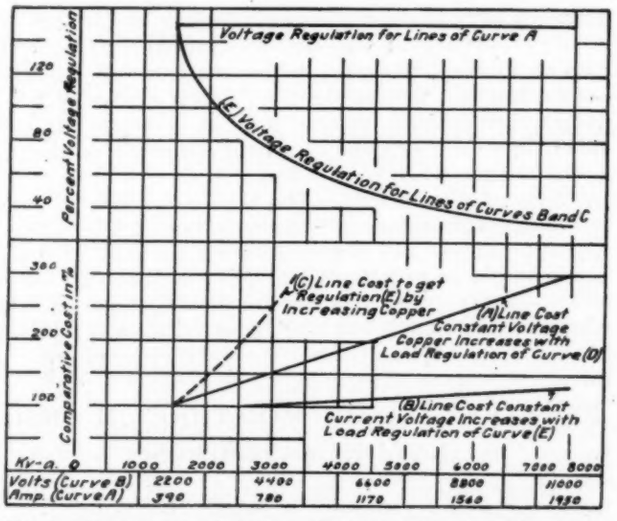

Voltage Regulation for Lines of Curve A
(E) Voltage Regulation for Lines of Curves B and C
Percent Voltage Regulation
120
80
40
300
200
100
Comparative Cost in %
(C) Line Cost to get Regulation (E) by Increasing Copper
(A) Line Cost Constant Voltage Copper Increases with Load Regulation of Curve (D)
(B) Line Cost Constant Current Voltage Increases with Load Regulation of Curve (E)
Kv-a. 0 1000 2000 3000 4000 5000 6000 7000 8000
Volts (Curve B) 2200 4400 6600 8800 11000
Amp. (Curve A) 390 780 1170 1540 1930

Fig. 1.—Approximate Relations Between Line Capacity, Costs, Voltage Regulation When Increased Capacity Is Obtained by Increasing Copper and Increasing Insulation.

can be saved both in investment and operating cost by increasing the line voltage.

In practice, the cost of consumers' installations connected to the line must be considered as well as the cost of the line itself. The cost per kv-a. of these installations decreases as their size increases, because of the smaller unit cost of transformers, fuses, lightning arresters, etc., for the larger capacities. Their cost also increases as the voltage at which they are to be operated increases, the increase in cost with increase in voltage being more rapid for small than for large installations. Usually, however, the insulation of equipment used on 2300-volt delta-connected trans-

former installations is sufficiently high to permit of operation on a line voltage of 4000, this being accomplished by changing the connections of the transformer primaries from 2300 volts delta to 4000 volts star. Under such circumstances no additional cost will be incurred in changing transformer installation

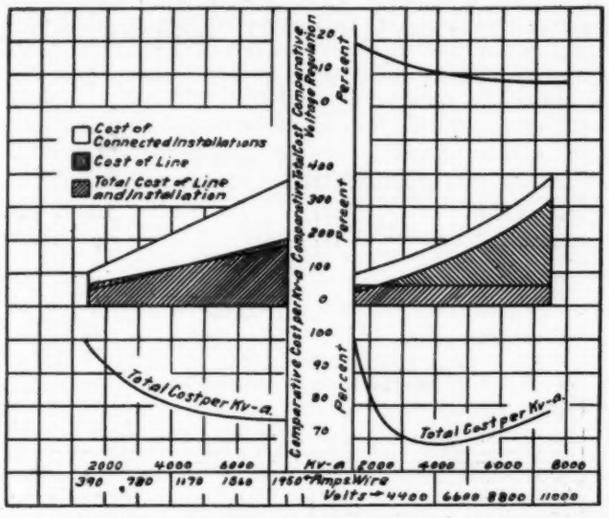


Fig. 2.—Relative Costs and Voltage Regulations for Increasing Capacity Including Lines, Connected Installations and Substations.

to 4000 volts. For a specific case, the extent to which copper or voltage will be increased depends on the cost of the line in relation to the cost of the connected installations. When the cost of the line is high compared to the cost of connected installations, increase in capacity will demand a considerable increase in voltage.

This condition exists when the connected installations are of large capacity and scattered, and the line copper already installed loads the poles heavily. When the cost of the line is low compared to the cost of connected installations, it will not be desirable to increase the voltage so much; it might prove more economical to increase the copper. This condition exists when the connected installations are small and close together and the poles are not already carrying much copper. In general, large connected installations, scattered load, long average transmission distance, make for more voltage and less copper; small connected installations, dense load, short average transmission distance make for less voltage and more copper.

In Fig. 2 the relative costs and voltage regulations are shown for increasing the capacity of a given 2200-volt distribution network by increasing the voltage and by increasing the copper, with lines, substation equipment and connected installations all taken into account. It will be seen that the least cost per kv-a. handled is obtained with voltages of between 4000 and 7000, while the regulation comes down, rapidly at first, from 20% at 2300 volts, to 8% at 11,000 volts. Going still farther, in Fig. 3, costs of line, sub-station and connected installations per kv-a. handled are shown for various capacities at each voltage. These curves indicate that for the case at hand, for any capacity up to about 4500 kv-a., 4000 volts gives the lowest cost, while for loads above 4500 kv-a., 6600 volts shows slightly lower cost than 4000 volts. In the matter of voltage regulation, 14% is obtained at 4000 volts, while 10% is gotten at 6600 volts as against 20% for 2300 volts. From the point of view only of cost, therefore, there is not much difference between 4000 and 6600 volts. If, however, the higher voltage were practicable, it would be desirable because of the better regulation.

Tabulated are shown the data required and method used for calculating the results on cost per kv-a. indicated in Figs. 2 and 3. By determining this data for a given distribution system whose capacity is to be increased, and calculating the cost per kv-a. of the greater capacity, as indicated in the table, the most economical voltage can be determined with a very fair degree of accuracy. Distribution losses are not taken account of in these figures, but it is a reasonable assumption that the increased losses of the higher voltage transformers will be more than offset by the decreased line losses at the higher voltage. In determining the voltage to be used, due weight should always be given to the better regulations obtainable at the higher voltages.

Influence of Power-Factor.

If the load carried by a line has a power-factor of less than unity, the capacity of the line can be increased by improving the power-factor, since the kilowatts of power which each ampere on the line will deliver is directly proportionate to the power-factor. If, for example, the power-factor of a given number of amperes on a given line is increased from 80% to 100%, the number of kilowatts will be increased in to 100%, the number of kilowatts will be increased in the ratio of 80 to 100, or 25%, without increasing the amperes on the line. The improvement of the

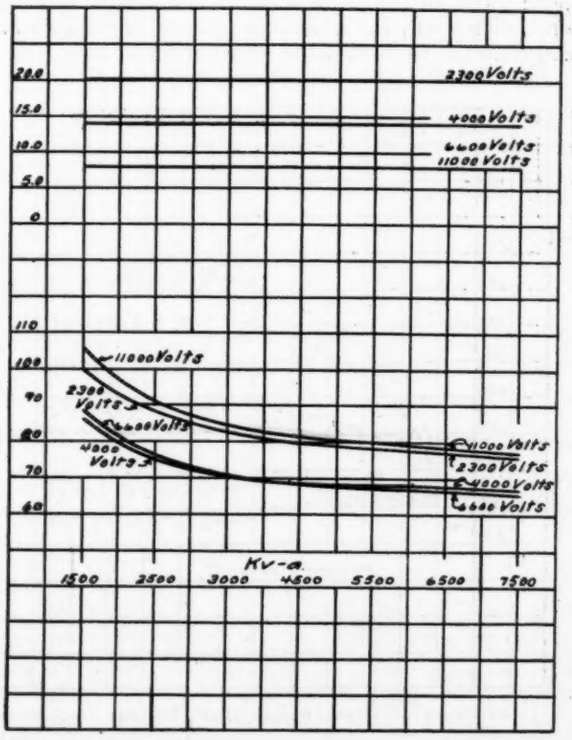


Fig. 3.—Costs of Line, Substation and Connected Installations Per Kv-a. for Various Capacities and Different Voltages.

power-factor not only decreases the cost of line per kilowatt by increasing the line capacity, but also decreases the cost of generating and transforming equipment. It, therefore, pays to spend money to improve power-factor as long as the total saving in line, trans-

forming and generating equipment is greater than, or equal to, the cost of making the improvement.

DATA FOR DETERMINING VOLTAGE AND LINE COPPER TO SECURE INCREASE IN CAPACITY OF A DISTRIBUTION NETWORK AT MINIMUM COST.

	Existing system.	Required increase			
Kv-a. measured at substation	1,500	4,500	4,500	4,500	4,500
Line voltage	2,300	2,300	4,000	6,600	11,000
Cost of substation transformers	$ 5,000	$ 15,000	$ 15,000	$ 18,000	$ 20,000
Cost of present connected installations	15,000	15,000	15,000	18,000	25,300
Estimated cost of new installations sufficient to absorb increased capacity	.....	30,000	30,000	36,000	50,700
Cost of pole line	15,000	20,000	17,500	16,500	19,500
Cost of line copper	15,000	45,000	26,000	15,000	9,000
Total cost	$50,000	$125,000	$103,500	$103,500	$124,500
Total cost per kw.	$33.33	$27.80	$23.00	$23.00	$27.70
Voltage regulation, per cent	20	20	14	10	8

More money can be spent in improving the power-factor when the line costs are high, *i. e.*, in general when the voltage is too low for the loads and transmission distances involved and cannot be increased to the proper amount on account of external limitations.

The power-factor of the load also affects the voltage regulation. This is shown in Fig. 4. Where the line wires are large—No. 1/0 or No. 4/0, for example—voltage regulation improves very rapidly as the power-factor is raised. As the wires become smaller, the effect of power-factor on regulation grows less, and for No. 3, or smaller wire, becomes so slight as to be unimportant. Looking at this effect from another viewpoint, for a constant power-factor and load proportional to conductor cross-section, the voltage

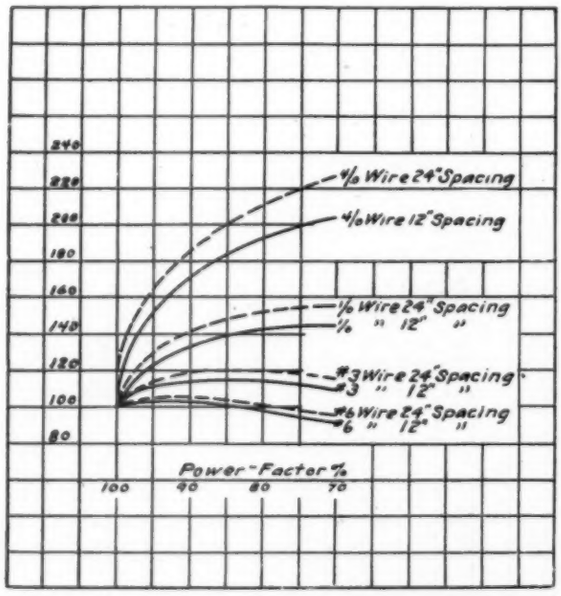


Fig. 4.—Effect of Power-Factor Upon Voltage Regulation.

regulation becomes rapidly poorer as the line wire becomes larger. This result must be watched when increasing the copper in a line by replacing a small line wire, such as No. 3, with a No. 1/0 or No. 4/0 wire.

Low power-factor on central-station systems is due chiefly to induction motors and can be improved by fitting the installed motor capacity more closely to the load, by replacing induction motors with synchronous motors where possible, or by installing corrective apparatus, such as synchronous or static condensers, phase advancers, etc. This apparatus should be installed as near as possible to the load which causes the low power-factor. Such corrective apparatus either may be installed by the customer or by the central station. If it is to be installed by customers, a power-

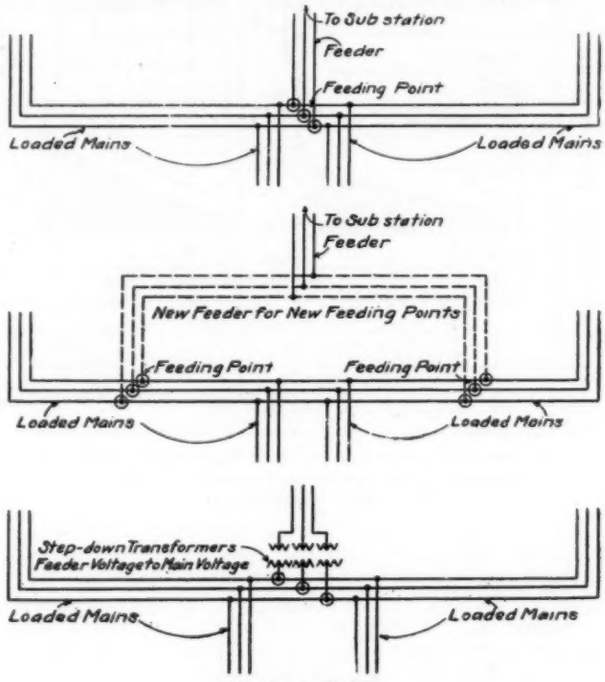


Fig. 5, A, B, C.

factor clause should be inserted in the rate schedule, by which the rate will be decreased as the power-factor is raised, in order that the customer may be compensated for the additional expense involved in improving his power factor.

Increasing Distribution Voltage.

In almost every actual power distribution network, where an existing 2300-volt system is sufficiently loaded to require an increase in capacity, it will be found desirable and economical to increase the line voltage from 2300 to 4000. Ordinarily, the insulation of line and connected installations on a 2300-volt system is heavy enough to stand 4000 volts, so that the only change necessary is to reconnect transformers from delta-delta to star-delta. In some cases it may be necessary to provide substation transformers with more insulation on the secondary windings or to modify somewhat the substation switchboard; if, for example, single-phase circuits are fed from the same substation transformers as the three-phase circuits, it will be necessary to install separate transformers for the two classes of circuits, or to run a fourth bus to the neutral of one star connected bank and connect the single-phase circuits between this neutral and the line busses. Or where single-phase installations are already connected between line wires, new transformers for 4000 volts primary may be required. These items are generally unimportant, so that by changing the voltage of a distribution network from 2300 to 4000, an additional 73% capacity and a materially better regulation can be obtained at practically no cost. On systems operated at more than 2300 volts, where

the transformers are connected in delta-delta, a raise in voltage of 73% can be similarly accomplished by reconnecting the transformers for star primary, but transformer and line insulation will not be sufficient to stand the higher voltage, unless original conditions are retained by dead grounding the neutral of the substation transformers. When this is done, the potentials to ground with the star connections and higher voltage between line wires are held to the same values as existed with the lower line voltage and free neutral. There is, however, a serious objection to the dead grounding of the neutral, in that every time a line wire becomes grounded, a short circuit is produced and the circuit is interrupted. A distribution network with grounded neutral will always suffer more interruptions than will one with a free neutral.

If it becomes desirable to increase the line voltage by more than 73%, it will be necessary to reinsulate the lines and install new transformers throughout. To justify the latter requirement, some use must be found for the transformers discarded: on growing systems this is not difficult, for they will soon be used up in other localities where the load has not yet developed sufficiently to justify the higher voltage.

Where installations connected to a network are grouped in a system of mains supplied by a feeder connected in at a central point, increase in capacity can be obtained by increasing the number of feeding points and increasing the capacity of the feeder only by increasing its copper or raising its voltage. This scheme is shown diagrammatically in Figs. 5 b and d. The capacity of the mains will be in direct proportion to the number of feeding points, if these are properly placed. The proper placing is accomplished by dividing the network into as many parts as there are proposed feeding points, each part containing an equal load; the feeding point for each part will then be placed at the center of its load. Sometimes where a few large customers represent most of the load in a given network, but there are also connected a large number of small customers which constitute only a small part of the total load, it will pay to run two parallel mains from the same feeder—a high voltage main for the large installations and a low voltage main for the small ones. The feeder will be at the high voltage and will supply the low-voltage main through step-down transformers, see Fig. 5e.

In cases where voltage regulation is a limit to the

TABLE OF SCHEMES FOR INCREASING CAPACITY OF EXISTING LINES—SEE ALSO FIG. 5.

Explanation of Symbols:	Existing conditions.	Proposed conditions with increased capacity.
Line voltage	E1	E2
Numbers of feeding points	K1	K2
Cross-section of line wire	C1	C2
Power-factor	Pf1	Pf2

Scheme No.	Reference Fig. No.	Method of increasing capacity.	Changes required in line.	Changes required in substation and connected installations.	Line regulation reduced in ratio.	Capacity increased in ratio	Availability.
1	5a	Original system.	.....	.....	.....	.....	.....
2	5b	Increase cross section of line wires from C1 to C2	Increased copper.	None.	1	$\frac{C2}{C1}$	Very small and numerous connected installations. Short transmission distances. Not much copper on poles.
3	5a	Increase voltage from E1 to E2	New insulators throughout. Possibly more clearance between wires.	New transformers throughout.	$\frac{E1}{E2}$	$\frac{E2}{E1}$	Large connected installations. Long transmission distances, heavy copper on poles.
4	5a	Special case of No. 3—Increase voltage from E1 to $\sqrt{3}$ E1	None.	Connect all transformers star-delta. Ground neutral of substation transformer bank	$\frac{1}{\sqrt{3}}$	$\sqrt{3}$	See No. 3. Grounding of neutral may cause excessive interruptions to circuit.
5	5a	Special case of No. 4—Increase voltage from 2300 to 4000.	None.	Same as No. 4, except that neutral need not be grounded. Slight changes sometimes at substation.	$\frac{1}{\sqrt{3}}$	$\sqrt{3}$	Available in almost every case to obtain 73% increase in capacity. Very desirable.
6	5c	Increase cross section feeder and increase number of feeding points from K1 to K2.	Increase feeder copper in ratio $\frac{K2}{K1}$	None.	None	$\frac{K2}{K1}$	Short feeder lengths. Many connections. Average size small—grouped close together.
7	5d	Increase feeder voltage from E1 to E2 and feeding points in ratio $\frac{E2}{E1}$	New insulators on feeder only. Possibly additional clearance between wires. Step-down transformers between feeder and main at each feeding point.	New transformers at substation. No changes on connected installations.	$\frac{E1}{E2}$	$\frac{E2}{E1}$	Long feeders—heavy load. Many connections. Average size small—grouped close together.
8	5e	Increase feeder voltage from E1 to E2. Increase voltage on large connections to E2. Retain E1 on small connections.	New insulators on feeder and existing mains. Additional mains at existing voltage for small connections. Transformers between feeder and new mains.	New transformers at substation and on large connected installations. Small connections transferred to new mains.	.....	$\frac{E1}{E2}$	May be used where greater part of load is on large connections, but remaining small part goes to very many small connections.
9	Any of above	Improve power factor of load.	None.	Install corrective apparatus at suitable locations as near as possible to origin of low p. f. May be done by customer of central station.	See Fig 5	$\frac{Pf2}{Pf1}$	Load largely induction motors or other low p. f. apparatus. Cost of line high, due to long transmission distance or too low voltage.
10	Any of above	Install voltage regulator at substation.	None.	None.	.....	.....	Desirable only when highest possible line voltage gives too poor regulation—regulator must be carefully adapted to load.

capacity of the line, even after line voltage and power-factor both have been raised as much as practicable, the capacity of the line may sometimes be brought up to the heating limit of the copper by the installation of voltage regulators at the sub-station. If this scheme is attempted, care must be taken that the regulators selected will operate satisfactorily on the particular load to which it is to be applied, for many types of regulators will be found impracticable when applied to loads having the rapid and wide fluctuations of the ordinary industrial power load.

In the foregoing discussion, it has been attempted to show how the need for increased capacity of power distribution lines and networks, brought about by the rapid growth of the central station power load, can best be met under different conditions. In general, power distribution systems are carrying at the original voltage for which they were designed, much greater loads than they were originally designed for, and their capacity can be best increased by increasing the voltage, both from the point of view of cost and quality of service as measured by voltage regulation. If the existing voltage is 2300, a raise to 4000 can generally be made very readily and in almost every case will be found desirable. By this means, an increase in capacity of 73% can be obtained with little

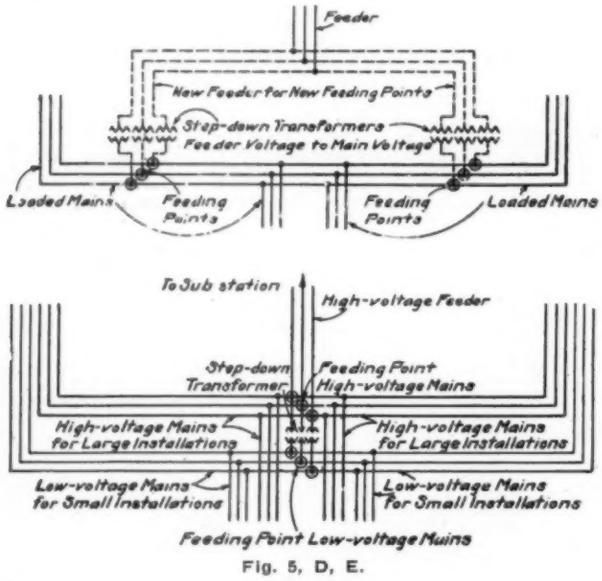


Fig. 5, D, E.

or no new equipment, and at very low cost. In some cases a greater increase in voltage will be desirable, in which case the reinsulation of lines and installation of new transformers will be required. Too high voltage, however, may prove as costly as too low voltage, because of the higher cost of connected installations, so that after the proper voltage is reached, further increase in capacity can best be obtained by increasing the copper. The highest voltage permissible is desirable, however, because of the better regulation which it gives. In some special cases, increased capacity of a distribution network may be obtained by increasing the feeder capacity only and providing additional feeding points for the mains, by raising the power-factor of the load carried, or by installing voltage regulators at the substation.

By way of conclusion, the accompanying tabulation is submitted, showing the various schemes which have been proposed above for increasing the capacity of existing lines.

PUBLIC UTILITIES LAW PROPOSED BY TEXAS MUNICIPALITIES.

League of Texas Municipalities Institutes Movement for Enactment of Law Governing Public Utilities in the State.

Many of the cities and towns of Texas, through their municipal officers, have joined in a movement to bring about the enactment of a public utilities law by the legislature at its next session. While a few of the members of the League of Texas Municipalities have voiced disapproval of the proposed law, the opposition from this source is not regarded as being of much moment.

It is announced that a business session of the League of Texas Municipalities will be held at Dallas on Oct. 18 for the purpose of receiving the report of a committee of its members which was appointed at a recent meeting held in Austin to draft a measure which would provide regulation of some nature of the public utility properties in Texas. At the Austin meeting the proposition was thoroughy discussed. Representatives of 52 cities were present and letters were received from many more who could not attend. At that time it was generally understood that a measure of some kind providing regulatory powers for the utilities was desirable, and the meeting finally agreed upon the appointment of a committee to draft tentative provisions. It was the plan to later call a meeting of the Texas mayors and submit the matter for their approval, after a copy of it has been sent to each for consideration and study.

In order to properly finance the league in its organization for the purpose of protection of the respective interests of the cities and towns, it was decided to levy an assessment upon each city on the basis of one cent per capita for each person, according to the 1910 census. The money to be collected will not be used for any purpose except the proper drafting of a bill to be presented to the legislature for the avowed curbing of the power of public utilities. It was specifically agreed that no paid lobby would be maintained to urge its passage. A number of state officials are reported favorable to such a regulatory measure.

LOSS FROM RUSTING OF STEEL.

It is now quite universally admitted that the rusting of iron and steel is one of the serious industrial problems. If we assume an average life of steel to be 33 years, the depreciation charge of 3% represents, according to the United States Bureau of Mines, a yearly loss of 1,000,000 tons of product in this country for the crude or semi-finished material alone, exclusive of correlated manufacturing costs. The inevitable rusting of steel may be justly claimed to be the mainstay of the zinc industry, as 60% of the metallic zinc used in the States is for galvanizing iron and steel articles, representing an annual outlay of $20,000,000 in an endeavor to protect metals from decay. Enormous amounts of paint are used in a like endeavor. About 5,000,000 tons of coal are needed in the production of steel to replace the annual waste, and 1,000,000 more for replacing the zinc that is annually lost. No estimate can be made of the value of the brass, bronze, copper, aluminum, nickel, tin and other metals and alloys used in machine parts, as sheathing, for plating, etc., to protect steel, or as a substitute for it in places where it would be used, but for its lack of resistance to atmospheric attack.

Editorial Comment

In the Cause of Safety

NO MORE important movement has taken place during recent years than the safety movement. It is one closely related to our industrial life, one interrelated to the well-being of every class, and one vitally affecting our economic and social welfare. During this week the largest convention ever held by the National Safety Council took place in Cleveland. The program presented was most extensive; every phase of industry was covered by papers on specialized subjects. The attendance was the largest in the short but successful history of the organization. It might be said that the rate at which the gospel of "safety" has spread has been phenomenal. The safety movement must be recognized as a factor in our industrial life.

The havoc wrought by death and suffering, the economic loss and the social and domestic problems created by accidents in the industries of this country are appalling. And this loss reacts throughout our national life in a thousand ways by creating widows and orphans, dependents and delinquents; causing poverty; breeding class bitterness and entailing economic loss. These are just a few of the phases of this vast problem of accident prevention that have been tackled so comparatively recently and that has progressed with such magnificent rapidity because of the justice of its cause and the urgency of its success.

If you have delayed so long, go over to the interests of the safety movement today. Affiliation with a recognized safety organization shows you realize your responsibilities; you have at least taken sides in this great issue of safety versus those tireless enemies—carelessness, thoughtlessness, recklessness and ignorance—that are taking an annual toll in this country exceeding that of the American army in the World War.

Each of us has done our part to make the world safe for democracy. Let each of us now do our best to make industry safe for humanity.

Increasing the Capacity of Existing Lines

VOLTAGE regulation is of paramount importance. It and continuity of service supply are the criteria of service. Upon voltage regulation depends revenue, since revenue from energy is based upon the product of current and potential.

However this is not all. Voltage regulation may also be said to be the criterion of line cost, and when voltage regulation becomes excessive it is a pretty safe statement to make that both operating costs and investment can be reduced by increasing line voltage and thereby improving voltage regulation. This matter of increasing the capacity of existing transmission and distributing lines by increasing the voltage is dealt with elsewhere in this issue in a very interesting and able manner by Mr. E. C. Stone.

In this article are pointed out the relative costs of increasing capacity of existing lines by increasing the cross-section of the copper on the one hand and increasing the pressure on the other. It is shown that when the cost of a line is high compared to the cost of the connected installations, increase in capacity will demand a considerable increase in voltage. This condition exists when the connected installations are of large capacity and are scattered, and the line copper already approaches the wise loading of the poles. When the cost of a line is low as compared to the cost of the connected installations, it is not desirable to increase voltage very much, but instead may be more economical to increase the cross-section of the conductors. When connected installations are of small unit capacity, when they are close together, and the conductors already strung are comparatively light, the above condition obtains, and increasing the conductivity rather than increasing the voltage is usually indicated.

As Mr. Stone ably points out, the current-carrying capacity of any line or circuit is limited by the maximum number of amperes it can carry as to heating, voltage regulation or economy of operation; by the maximum voltage at which it can be operated as determined by the properties of the insulation; and the power-factor of the load carried. Current, voltage or power-factor are therefore the three factors involved in determining the total cost involved. Power-factor affects current-carrying capacity of conductors; it affects voltage regulation, hence the importance of not allowing preventably low power-factors from occurring is obvious.

Voltage regulation, one of the criteria of service, and also the criterion of line cost may often be bettered, the capacity of a line increased, and service improved by installing voltage regulators in the feeders or lines. The use of voltage regulators in this way to increase the capacity of existing feeders is commonly resorted to, with all the other gains that accompany such an installation.

There is one phase of this matter of increasing the capacity of existing lines, touched upon by Mr. Stone, that deserves enlarging upon somewhat. In the article referred to it is pointed out that three-phase 2300-volt lines can advantageously be converted to 4000-volt three-phase lines by simply changing over from a

delta to a star connection. In doing this the benefit of transmitting at 4000 volts and distributing at 2300 volts is obtained; such a method has been employed by several of the central stations operating large alternating-current distributing networks. The familiar three-phase four-wire system of distribution is the most flexible system possible, also probably the most economical from every aspect. There are many companies today who could advantageously change over from a delta 2300-volt system to a 4000-volt star.

Fire and Life Hazards and Electrical Codes

FIRE breaking out in any building is always a serious menace, not only to its property contents but also to the lives of its occupants. This fact is generally recognized by everyone, even by fire-insurance interests, although the latter have seldom any immediate business concern in the matter of life hazard. Early regulations of fire underwriters aiming to minimize the fire hazard seldom made any special mention of requirements to reduce the menace to life and this was usually left to the public authorities. The latter, however, seldom took definite steps until after some serious catastrophy that showed the necessity therefor.

In the first electrical code developed in this country (the National Electrical Code, now issued by the National Board of Fire Underwriters) the effort to minimize hazards to life was not strongly evident until the last few years. In the 1918 edition of this code this matter received greater attention than ever before.

In the National Electrical Safety Code, issued by the Bureau of Standards a few years ago and now in process of revision, the primary effort was to draft rules to minimize the life hazard as regards purely electrical causes since this had not yet been comprehensively covered in any previous set of rules of widely recognized standing. It is interesting to note that in the present revision much more extended rules covering the reduction of fire hazards is included, this being evidently due to the effort to minimize the danger to life that usually attends a fire. For instance, in the proposed revised rules of Part I, the principal changes in which are mentioned in another part of this issue, the matter of fire prevention in power houses and substations is given considerable attention. This is as it should be, especially in view of the fact that the rules covering this class of structures in the National Electrical Code are not comprehensive.

Mention is also made in this issue of the new electrical code just issued by the City of Chicago. In this provisions to safeguard against fire are also much more comprehensive than ever before, and special rules are introduced to cover assembly halls, exposition buildings and other places where people are likely to congregate in large numbers. These new rules, in addition to those already in force regarding theaters, make probably the most complete set of regulations aiming to minimize the life and fire hazards in places where they are most likely to cause the greatest danger on account of the large number of persons involved.

We are glad to see that the various electrical codes are gradually recognizing both of these serious hazards and we believe that after some years both the fire and the safety codes will necessarily approach each other in completeness in covering both these dangers. The ultimate outcome may be, in fact it is being hoped by many that it will be, a combination electrical code covering both fire and life hazards thoroughly.

Cost Data and Man-Hours

"HOW MUCH will it cost?" "What did it cost?" These are the questions the central-station manager, the contractor, the construction engineer and many more ask when inspecting a finished job of interest or when asked to sanction commencing a job.

Costs of work to be carried out may be determined either by piece by piece estimate, by calculation, or estimates may be based upon its similarity to previous jobs. Frequently both methods of determining what it will cost to do a job are employed—experience of others, of oneself and by estimate. Cost data are, therefore, of considerable value to the engineers, to contractors, structural engineers and executives, for they broaden one's experience, save time and are of general usefulness.

However, much of the cost data published is not of nearly the usefulness it might be were it presented in a form other than it is. Labor is often a large item, frequently the chief item, in the cost of a job. The cost of labor varies in different parts of the country; it varies from time to time. Obviously, therefore, it is desirable to reduce the item of labor to the least common denominator so that it may be applied anywhere. This can be done very simply by expressing labor in "man-hours" alone or in conjunction with the cost of labor. Both are most useful, and the latter more generally useful since more generally applicable than the former.

If it is known how many man-hours are required to erect a steel tower, to assemble a steam turbine, test the efficiency of a water turbine, or lay a run of conduit, it is an easy matter to charge off an expense equivalent to such a force divided into its constituent parts of supervision, inspection, etc.

One of the accusations brought against the unionization of labor and the closed shop is that production is lowered and the cost of production raised. Data on a basis of man-hours, distinguishing between union and non-union work of the same kind, would show immediately just to what extent unionism tends to curtail rate of work, hence cost of work, because, in man-hours, time and men are the factors, not money.

Current Events

More Electrical Conventions Held—New York Show a Success—Ambitious Plans of N.E.L.A. Publicity Service Bureau

PRESIDENT BALLARD'S VIEWS ON RELATIONS WITH EMPLOYES.

Excerpts from an Address Before Recent New England Section Convention at New London, Conn.

In addressing the convention of the New England Section of the National Electric Light Association, at New London, Conn., on Sept. 24, President R. H. Ballard dwelt in some detail upon the great profit-sharing or employes' participation movement which had its inception with the big industrial organizations of the United States previous to the war and is now being adopted by the smaller business groups. The following excerpts from his remarks convey the trend of his argument:

"It is desirable that wage earners shall have opportunity to earn sufficient to maintain themselves and their families at a reasonable standard of comfort; to protect their dependents against poverty in case of death and to provide against want in old age."

"Our constructive problem seems to shape itself along these lines: Can the millions of workmen in the United States be gradually brought into partnership in the business in which they are employed without nullifying the result of partnership by placing the management of the industries in the control of those untrained in the administration of such affairs?"

"What our workers want is opportunity—opportunity to take part in the world's industries, and to weld their work, their earnings, and their intelligence."

"This striving after individual opportunities has brought the world out of barbarism and imperialism and is blazing the way to participating co-operation."

"Participation preserves the vital spark of individualism—that intangible factor of success which has written the story of progress on every page of the world's recorded history."

"Centralizing is the parent of participation because in eliminating ruinous competition, it automatically takes men out of destructive pursuits and sets them at harmonious production."

"The great element of success in our present-day profit-sharing movement is that it is being worked out by some of the best and most constructive minds of our generation—the minds that guide these great industries are simply expanding the methods that have made their own enterprises successful, and extend to those who are engaged with them the opportunities to become partners, preserving to them the stimulus of the personal quality of success—Individualism."

"If the business itself is a success, that is proof conclusive that its organization is sufficient for those who participate in its benefits."

"Mutual interest is the basis of every enduring human structure. The big central thought of the participation idea finds expression in the slogan of Dumas, 'Three Guardsmen, One for all, all for one.'"

"In hectic denunciation what do we achieve? In constructive thought, what may we not achieve?"

"Bolshevism is an idea; Socialism is an idea. They can best be corrected by presenting better ideas."

"Participation is the American antidote to Anarchy."

ACTIVITY MARKS CONVENING OF IRON AND STEEL ELECTRICAL ENGINEERS.

Interesting Program, Animated Discussion and Light Attendance Features.

The Association of Iron and Steel Electrical Engineers held its thirteenth annual convention at the Hotel Statler, St. Louis, during Sept. 22 to 26, inclusive. The report of this convention was held out of the last issue of the ELECTRICAL REVIEW due to the fact that there were so many other conventions occurring at the same time and space was limited. The convention was a very live one as regards papers and discussions but somewhat light in attendance, there being about 250 present.

In the annual presidential address President Petty outlined the work of the association during the past year, laying special emphasis upon the work of the various sections and committees of the association. Special reference was made to the work of the Standardization Committee's work. The association can now boast of five sections, namely, Birmingham, Chicago, Cleveland, Philadelphia and Pittsburgh, all of which are actively engaged upon the work for which they were organized. Reference was made to the very satisfactory growth of the association, which had 28 members in 1907 and in 1918 had 1020 members, with every prospect that before the close of the present year there would be 1200 members. There has already been an increase of 206 members during the first eight months of this year.

The first morning of the convention was devoted to the transaction of business, the reading of the various committee reports and the election of officers. In the afternoon A. B. Holcomb, chairman, Educational Committee, presented his report, as did also Walter Greenwood, chairman of the Safety Committee.

The morning session on Sept. 23 was given up to the presentation of joint papers on "Organization of the Electrical Department in the Iron and Steel Industry." The papers presented were "Inspection and Operation of Electrical Apparatus," by J. A. Morgan and J. J. Booth; "Educational Training for Electrical Employes," by B. A. Cornwall; "Electrical Repair Shop," by C. A. Menk; "Storeroom and Spares," by T. E. Tynes, and "Records and Tests," by R. B. Gerhardt. These papers being of a practical nature and on such subjects as concern every steel mill, almost everyone present took part in the discussion. The afternoon was devoted to excursions to places of local interest.

Wednesday morning and afternoon were devoted to the presentation of papers and their discussion. The annual banquet was held in the evening. W. S. Hall presented a paper in the morning on the subject of "A. C. Versus D. C. Motors for Rolling Mill Table Drives," in which the characteristic curves of the different types of motors were pointed out and their bearing upon motor performance and mill table drive explained. It was stated that there is no reason why the a-c. motor could not readily replace the d-c. motor, providing that the maximum torque of the former is sufficient for the job. The fact that the alternating-current motor cannot be readily abused is a great advantage, while the fact that table load conditions change from time to time over a wide range makes the constant-speed characteristic of the induction motor quite an advantage. A number of typical motor drives are taken and comparisons made of cost, time of performance and horsepower required. H. D. James, Westinghouse Electric & Mfg. Co., then presented his paper on "Recent Improvements in Industrial Control."

In the afternoon two papers were presented. R. D. Nye, chairman of the Electric Furnace Committee, presenting his report on the "Present Status of Electric Furnaces in the Steel Industry," and C. A. Winder, General Electric Co., read a paper on "Electric Heat Treatment."

Thursday morning, Paul M. Lincoln read a paper on "Overload Protection for Motors." In the afternoon A. G. Place presented a paper on "Overload Protection of Cranes," and T. E. Tynes, chairman, Standardization Committee, presented his report.

On Friday morning a joint paper upon "Present Status of Arc-Welding in the Iron and Steel Industry" was taken part in by A. Churchward, Wilson Welder & Metals Co.; H. L. Unland, General Electric Co.; A. M. Bennett, C. & C. Electric & Manufacturing Co.; R. A. Kinkead, Lincoln Electric Co.; C. J. Holslag, Electric Arc-Cutting & Welding Co.; R. M. Rush, The Arcwell Corp., and A. M. Candy, Westinghouse Electric & Manufacturing Co.

The following officers were elected for the ensuing year: President, B. W. Gilson, Youngstown, O.; first vice-president, H. C. Cronk, Cleveland, O.; second vice-president, F. A. Wiley, Chicago, Ill.; treasurer, James Farrington, Steubenville, O.; secretary, John F. Kelly, Pittsburgh, Pa.; directors, R. F. Gale, Philadelphia, Pa.; J. E. Fries, Birmingham, Ala.; W. S. Hall, Chicago, Ill.; C. E. Bedell, Wheeling, W. Va.

CONVENTION DISCUSSES RELATION OF FUSES TO KNIFE SWITCHES.

Municipal Electricians at Chicago Meeting Approve Resolution Recommending Switches Protect Fuses—R. J. Gaskill Elected President.

The concluding sessions of the twenty-fourth annual convention of the International Association of Municipal Electricians, held at Chicago last week, were largely devoted to a discussion of a paper on "Relation of Fuses to Knife Switches and Service Wires," presented by Fred B. Adam of the Frank Adam Electric Co., St. Louis, Mo.

This paper brought out the fact that differences in practice exist as to placing fuses on the service and on the line sides of switches and this results in confusion to the manufacturers of switches and panelboards. In eastern states it is common practice to put the fuses on the line side in order to afford protection when re-fusing is done, while in central and western states it is customary to place the fuses so they will protect the switches. As an illustration, Mr. Adam cited a case where an eastern architect had specified panelboards for a western installation with fuses on the service side of the switches; it was only by chance that the manufacturer changed the specifications so it was possible to obtain approval of the inspector. In an effort to standardize practice Mr. Adam suggested the association pass a resolution to the effect that fuses be connected to the hinged or dead end of all switches. Objections to the suggested resolution were made by Joseph Sachs of the

Post-War Convention of International Association of Municipal Electricians, Held at Chicago,

Jchns-Manville Co., and A. McLaughlan of the Square D Co., the former stating action on the matter should bc delayed because standardization of inclosed switches is now being made, and the latter recommending adoption of inclosed type switches arranged so fuse clips are dead when renewals are being made.

Dr. M. G. Lloyd, Bureau of Standards, said the question was in a transition stage. Some years ago it was the practice to put fuses on the live side of switches, but now many exceptions were being made to this practice. The National Electrical Code rules that in inclosed switch devices it is permissible to place the switch ahead of the fuse, while the Electrical Safety Code makes this practice compulsory.

The matter was finally referred to the association's standardization committee, which offered a resolution to the effect that the fuses on all switches except service switches should be installed so that when the switch is opened the fuses will be disconnected from the source of supply. The convention approved this resolution.

William G. Keith, commissioner of gas and electricity, Chicago, read a paper on street lighting which gave a review of the progress made in street-lighting practice in Chicago and gave data on installation and operation of the series group system. This paper is published in full in another part of this issue of ELECTRICAL REVIEW.

At a business meeting held Friday, New Orleans was selected as the next meeting place and the following officers were elected for the year: Robert J. Gaskill, Fort Wayne, president; C. P. Steinmetz, Schenectady, N. Y., first vice-president; R. C. Turner, Atlanta, Ga., second vice-president; W. P. Briggs, New Bedford, Mass., third vice-president; F. A. Cambridge, Winnipeg, Can., fourth vice-president; C. R. George, Houston, Tex., secretary, and John Berry, Indianapolis, Ind., treasurer. Members of the new executive committee are W. L. Potts, Detroit, chairman; William Gaffney, Watertown, N. Y.; A. L. Duckett, Asheville, N. C.; Frank Williams, Elizabeth, N. J.; D. R. Snider, Augusta, Ga.; J. P. Allen, Jacksonville, Fla.; J. W. Bleidt, Little Rock, Ark.; W. G. Dey, Louisville, Ky.; Claude Converse, San Antonio, Tex., and Zack Morrison, Minneapolis, Minn.

The feature of the entertainment program was the annual banquet, which was held in conjunction with the Bureau of Electrical Inspection, City of Chicago. The gathering marked the thirty-sixth anniversary of the latter organization, which took occasion to formally welcome home its returned soldiers.

NEW YORK ELECTRICAL EXPOSITION IS A BIG SUCCESS.

Unprecedented Attendance and Interest Rewards the Exhibitors—Many Buyers Among the Visitors.

The New York Electrical Show, of 1919, that began on Sept. 24 and will continue through Oct. 4, is one of the most successful shows ever held in our largest city. The excellent accommodations provided by the Grand Central Palace, the building in which the show is held, are ideal for exhibitions on a large scale, but they are none too large for the present show. All space on the first floor and most of that on the second floor is occupied by exhibits. Conversations with exhibitors reveals the fact that many of them underestimated their own needs for floor space and that they are making efforts to obtain additional space to accommodate the crowds of interested spectators that are visiting the exposition.

Exhibitors report that the interest shown by the crowds attending the exposition is larger this year than ever before. The audience is spoken of in fact as a buying audience. Nor is the interest confined to the male visitors only. The scarcity of domestic help in the home and the increasing number of labor-saving electrical devices has created an interest in the minds of the ladies that is revealed by the large numbers of them that are attending the exposition and are making inquiries about the devices exhibited. The ordinary comment of those having exhibits is that no

Ill., Sept. 23-26, Proves Noteworthy Because of Large Attendance and Interesting Program.

such interest on the part of women ever was discernible before, that the amount of floor space in the booths and the number of experienced demonstrators is inadequate, and that the visitors are essentially buying visitors. Most exhibitors report a larger number of sales than they ever made before in a similar interval of time.

The list of exhibitors is as follows:

Allen Sales Service, Inc., 347 Madison avenue
Alpha Electric Co., 149 West 30th street.
American Ironing Machine Co., 70 West 45th street.
American Bronze Products Co., 25 Third avenue.
Baker, R. & L., New York Corp., 17 Central Park West.
B & K Manufacturing Co., 200 Fifth avenue.
Bennage Co., New York Appliance Co., Times Building.
Bohn, C. C., Electric Co., 820 Sixth avenue.
Branden, Hedges, McLain, Inc., 80 Maiden Lane.
Brokaw, Eden Co., 50 East 42nd street.
Brooklyn Edison Co., Inc., 360 Pearl street, Brooklyn.
Buerkle, W. A., Sales Company, 212 Livingston street, Brooklyn.
Clements Manufacturing Co., 1472 Broadway.
Cockaday, L. M., & Co., 2674 Bailey avenue.
Commercial Electric Truck Co. of America, 405 Lexington avenue.
Comstock Household Service, 21 East 40th street.
Consolidated Telegraph & Electric Subway Co., 54 Lafayette street.
Contra-Pole Electric Co., 1227 Prospect place, Brooklyn.
Cooper-Hewitt Electrical Co., Hoboken, N. J.
Dayton Pump Manufacturing Co., 30 East 42nd street.
Delco Electric Laboratories Co., 18 West 62nd street.
Display Stage Lighting Co., 314 West 44th street.
Duntley Products Co., 295 Fifth avenue.
Duparquet, Huot & Moneuse Co., 110 West 22nd street.
Edison Electric Appliance Co., 147 Waverly place.
Electric Meter Corp., 55 Liberty street.
Electric Storage Battery Co., 19th and Alleghany streets, Philadelphia, Pa.
Electrical Testing Laboratories, East End avenue and 80th street.
Eureka Vacuum Cleaner Co., 12 East 42nd street.
Federal Sign System (Electric), 627 West 43rd street.
Federal Telephone & Telegraph Co., Buffalo, N. Y.
Fitzgerald Manufacturing Co., Torrington, Conn.
Fox Electrical Corporation, The, 119 West 42nd street.
General Electric Co., 120 Broadway.
Geyser Electric Co.
Goodwill Electric Co., 70 Fifth avenue.
Guarantee Electric Products Co., 110 West 40th street.
Habirshaw Electric Cable Co., Inc., 10 East 43rd street.
Hamilton-Beach Manufacturing Co., 114 Liberty street.
Hart, Wallace B., 46 East 41st street.
Hartt & Morison, 780 6th avenue.
Home Devices Corp., 11 East 42nd street.
Hooven Letter Service, Inc., 387 Fourth avenue.
Hoover Suction Sweeper Co., 47 West 34th street.
Hot-Flo Faucet Corp., 1400 Broadway.
Hurley Machine Co., 151 West 42nd street.
Illuminating Engineering Society, 29 West 39th street.
Jorgensen, John, 114 Liberty street.
Kimball Electrical Construction Co., 42 East 23rd street.
Landers, Frary & Clark, 200 Fifth avenue.
Lansden Co., Inc., Danbury, Conn.
Latham, E. B., & Co., 550 Pearl street.
Laun-dry-ette Sales Co., 34 West 37th street.
Lightoiler Co., 569 Broadway.
Livingston, J., & Co., 104 East 41st street.
Maimin, H., Co., Inc., 251 West 19th street.
Majestic Electric Development Co., 1705 Alleghany avenue, Philadelphia, Pa.
Manhattan Electrical Supply Co., 17 Park place.
Manning, Bowman & Co., 200 Fifth avenue.
Metropolitan Detroit Electric Auto Co., 20 Central Park West.
Metropolitan Engineering Co., 35 Vestry street.
National Lamp Works, Nela Park, Cleveland, Ohio.
New Home Sewing Machine Co., 45 East 17th street.
New York Appliance Co., Times Building, 42nd street.
New York Edison Co., Irving place and 15th street.
New York Electrical School, 39 West 17th street.
New York & Queens Electric Light & Power Co., Bridge Plaza, Long Island City.
Nicholas Power Co., 90 Gold street.
Ohio Electric Co., 145 West 45th street.
Pease, Behning Co., 22 East 40th street.
Pittsburgh Electric Specialty Co., 396 Broadway.
Pneuvac Co., Worcester, Mass.
Rawson Electrical Instrument Co., Cambridge, Mass.
Regina Co., 47 West 34th street.
Royal-Eastern Electric Supply Co., 114 West 27th street.
Shelton Electric Co., 16 East 42nd street.
Sibley-Pitman Electric Corp., 190 6th avenue.
Sloane, W. & J., Fifth avenue and 47th street.
Stodder, E. D., 6 Prospect street, New Rochelle, N. Y.
Strauss & Co., Inc., 302 West 52nd street.
Thompson, Albert, Jamaica, L. I.
Tri-City Electric Co., 18 Mechanic Street, Newark, N. J.
Truswell, Wm., & Sons, 16 Cedar street.
Tucker Electrical Construction Co., 114 West 30th street.
United Electric Light & Power Co., 130 East 15th street.
U. S. Cloth Cutting Machine Co., 414 West Broadway.
Viking Sign Co., 560 Seventh avenue.
Waite & Bartlett Manufacturing Co., 252 West 29th street.
Walker Vehicle Co., Grand Central Terminal.
Ward Vehicle Co., Mount Vernon, N. Y.
Western Electric Co., 195 Broadway.
Westinghouse Electric & Manufacturing Co., 165 Broadway.
Wireless Improvement Co., 47 West street.
Yonkers Electric Light & Power Co., Yonkers, N. Y.

Although the list of electrical equipment exhibited includes practically every device for converting electrical energy into useful work, the exposition is described as appealing largely to those interested in applying electricity to household uses. Perhaps those who are interested in the barn and barnyard should be included among those to whom the exposition has an urgent appeal, since some of the most popular exhibits are those of electric trucks, of milkers actually demonstrated by milking a herd of cows, of lighting and heating devices for outbuildings as well as for houses, and of many other labor-saving devices for all purposes.

A visit to the exhibition shows that three general classes of exhibits have been arranged. These classes are commercial, demonstrative, and educational. The classification into which an exhibit is grouped depends upon the apparatus shown. Several concerns, such as the Walker Electric Vehicle Co., the Commercial Truck Co. of America, the Ward Motor Vehicle Co., the Habirshaw Electric Cable Co., Inc., the Federal Electric Sign System (Electric), and many others have arranged demonstrational exhibits showing the operation of some peculiar feature of their apparatus. Other concerns, such as the Cooper Hewitt Electric Co., the Electric Storage Battery Co., and the National Lamp Works, have arranged exhibits that are historical or educational.

Although some exhibits are classified as commercial, they are also demonstrative or educational. The vacuum cleaner and electric washer exhibits, of which there are a large number, contain numerous demonstration machines showing their operating features and the work they will do. Naturally such booths are overcrowded. Many of the exhibitors that are not giving demonstrations have been compelled to close their booths. The Remmert Mfg. Co., maker of the Locomotive Washer, is endeavoring to secure larger floor space. Brokaw-Eden Co., manufacturers of electric washers reports business as wonderful, attendants and salesmen, of whom there are 25, working in four-hour shifts, and more help needed. The Home Devices Corp. reports business as excellent, many orders received, people satisfied and paying cash. Hurley Machine Co. reports great interest and good business. And so on from all booths prepared to take orders or sell their apparatus.

PLANS OF ADVERTISING AND PUBLICITY BUREAU, N. E. L. A.

Most Ambitious Publicity Work on Electric Service Ever Undertaken Will Be Conducted by Newly Enlarged Bureau.

Recently there has been organized the Advertising and Publicity Service Bureau of the Commercial Section, National Electric Light Association, which combines under one head work previously undertaken by the Publications Committee, the Committee on Co-ordinate Advertising and Sales Campaigns, and proposed work on many new lines.

The aim of the bureau will be to make electric service a household word, develop a conversational familiarity with its terms, and spread a knowledge of what it is and the part it plays in industrial, commercial and household life throughout our entire country. The work of this bureau if spread over only a few years will make electric service as much appreciated and as freely used as are any high-class commodities, like automobiles, pianos and talking machines. The bureau will endeavor to secure this result by both direct and indirect means.

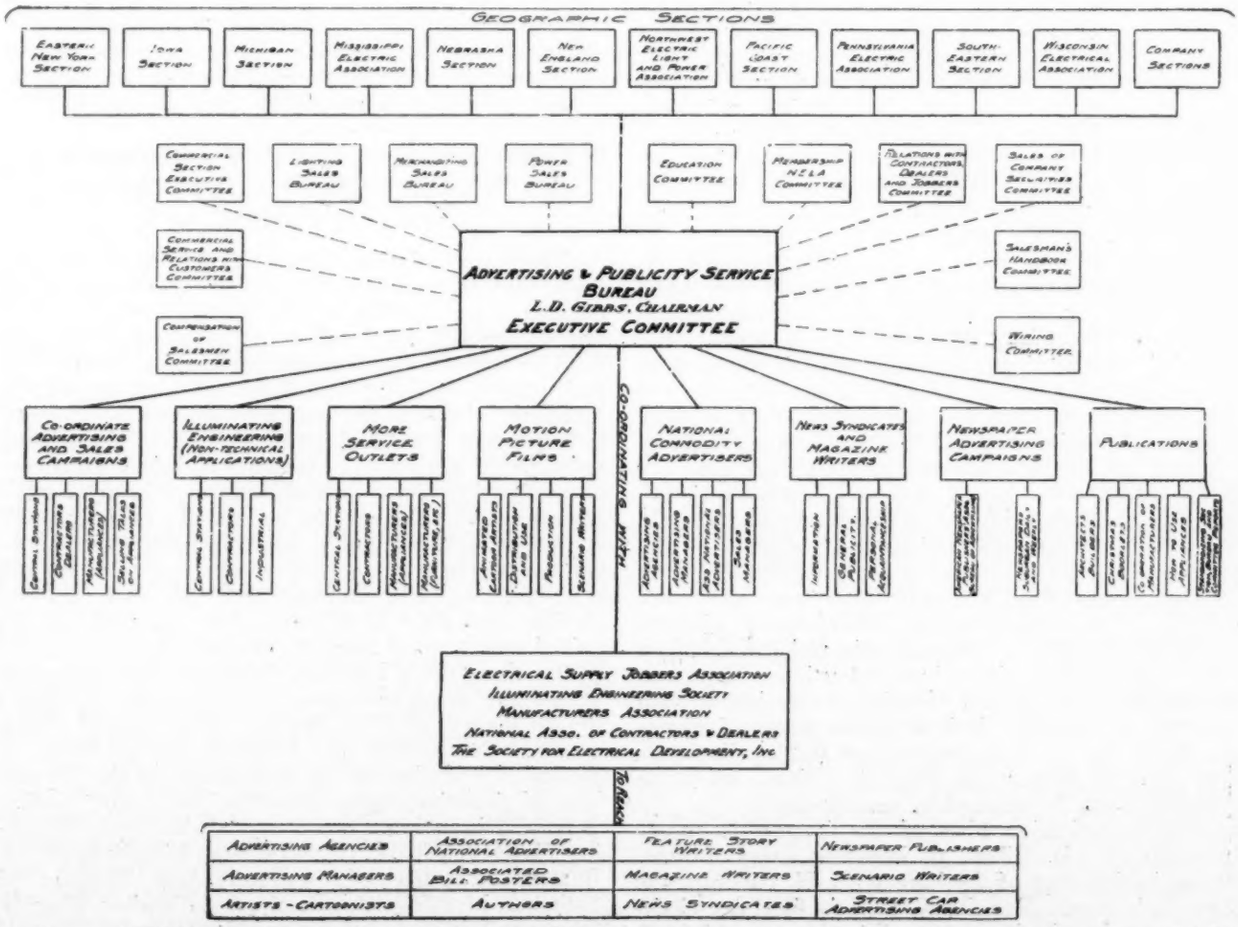
Following the lines already adopted by other bureaus, the membership in the Advertising and Publicity Service Bureau will be drawn from every state in the union, through the company and geographic sections, with cross-memberships in the other bureaus and independent committees of the Commercial Section, and through co-operation with co-ordinating associations.

These efforts will be directed toward reaching advertising agencies, advertising managers, artists, cartoonists, national advertisers, authors, feature-story and magazine writers, news-syndicate writers, newspaper publishers, scenario writers and street-car advertising agencies.

Appreciation of the plan and assurances of co-operation are already widespread. The presidents of the geographic sections are working enthusiastically along these lines; company sections are helping, and the managers of central stations are delegating their representative employes to serve in the bureau work.

The cross-membership idea will keep all other branches of Commercial Section activity informed on the bureau's work, members will keep in touch with all other activities, and duplication of effort and waste of time and money will be eliminated. Both the instinct and ability for promoting publicity will obviously dominate the activities of the bureau. For this reason, it ought to be possible to be of material assistance to other bureaus and committees in securing more general publicity for their work. Co-operation with other associations in related branches of the electrical industry will be made effective at every possible opportunity.

The Co-ordinate Advertising and Sales Campaigns Divisions will continue and extend the work already well begun. This work aims to systematize advertising campaigns and sales efforts to the end that: (1) Manufacturers may concentrate their advertising campaigns; (2) central stations, contractors and dealers may specialize in their selling efforts on the same appliances month by month throughout the year.



Organization Plan of the Advertising and Publicity Service Bureau, Commercial Section, N. E. L. A.

Definite co-operation in publicity work with the Illuminating Engineering Society is undertaken for the first time this year. The idea is to bring about a realization of the fact that the principles of good lighting can be applied nontechnically and so that, for instance, even an ordinary contractor can introduce these principles in his work and give his customers special service of lasting advantage.

The More Service Outlets Division will carry its educational work along far-reaching lines. For many years the importance of having installations fully provided with outlets has been realized and various committees have advanced the work. This new division will co-ordinate and stimulate these scattered efforts so as to bring the idea home to all branches of the industry as well as to the public in general.

An extension of activities into every branch of the field will be made by the Motion Picture Films Division, which will furnish advertising material to all connected with the motion-picture industry. The National Commodity Advertisers' Division will enter a new field for contact, this being the idea of illustration by means of electrical appliances or by showing applications where electric service plays the important part. Considerable work has already been done in making other industries realize that electrical appliances can be featured as part of their own advertising so as to show that the latter is thoroughly up-to-date.

The News-Syndicate and Magazine Writers' Division will reach into a new field. Here the development of appreciation for the timeliness of electricity and its service will result in more and better "copy." The aim will be to get in touch with the managements of news syndicates and their contributors such as furnish special articles to groups of Sunday magazines and Sunday newspapers; and also in touch with the writers of articles for magazines, such as the *Saturday Evening Post*, etc., with a view to having their names put on mailing lists so that they can receive up-to-date advertising material about electrical appliances and know where to write for information on electrical subjects which they may wish to use in articles they are preparing.

Newspaper campaigns are capable of great development. For a number of years efforts have been made to develop community of interest among central stations and electrical contractors and dealers so that so-called "electrical pages" could appear in the daily and weekly newspapers. If some plan can be devised that will be continuous and forcible in its action these pages can be maintained and the use of them extended. If pages cannot be developed, at least some plan for educating contractors and dealers to an appreciation of continuous advertising may be arranged which will result in ultimate good and greater increase of the business.

The Publications Division takes over the work that has been handled for many years under the Publications Committee. Through this division an effort will be made, first, through co-operation with manufacturers to get the most effective circulation of their advertising material. It is a foolish waste of money for the N. E. L. A. to prepare advertising literature that must be sold to the central stations, when the same field may be covered by manufacturers.

The organization plan of the bureau is shown herewith. L. D. Gibbs, 39 Boylston street, Boston, Mass., is chairman of the bureau; S. H. Gillerup, 130 East 15th street, New York City, is first vice-chairman, and I. W. Alexander, San Joaquin Light & Power Corp., Fresno, Calif., is second vice-chairman.

SPECIAL MEMBERSHIP CAMPAIGN FOR WESTERN SOCIETY OF ENGINEERS.

An intensive six-day membership drive is to be conducted by the Western Society of Engineers on Oct. 6 to 11, inclusive. This organization a few months ago celebrated its fiftieth anniversary and is one of the oldest engineering societies in the country. It is composed of engineers connected with the various branches of the engineering profession and has been since its modest beginnings in 1869 the engineering headquarters in Chicago. Its rooms and library on the seventeenth floor of the Monadnock block are the gathering place of a considerable number of engineering societies that hold either main or section meetings in Chicago.

The Western Society of Engineers has five sections devoted to electrical, mechanical, bridge and structural, sanitary, hydraulic and municipal, and gas engineering. Through the meetings of the main society and of its sections there are discussed a very wide range of technical problems at gatherings held practically every week, so that a member has the privilege of keeping in direct touch with the important developments in the principal lines of engineering and in personal contact with the leaders in the chief branches of the profession in the big district tributary to Chicago. At present the membership of the society is about 1200. It is believed that there are over 5000 engineers in and near Chicago that would derive great benefit from membership in this well established organization and from use of its facilites as the logical headquarters for the technical interests of the Chicago district. Many of these men are members of national engineering societies, but they also should have through membership in a strong local organization like the Western Society of Engineers means of keeping in contact with the engineering profession generally.

EIGHTH ANNUAL SAFETY CONGRESS OF NATIONAL SAFETY COUNCIL CONVENES IN CLEVELAND.

The Eighth Annual Safety Congress of the National Safety Council is meeting in Cleveland during October 1 to 4 inclusive. It is estimated that there are in the neighborhood of 4000 plant managers, safety engineers, employment supervisors, executives and others interested in accident prevention and the problems of industrial relations present. Nineteen different sectional meetings are being held, these being respectively automotive, cement, chemical, construction, electric railways, health service, local council officers, marine and navigation, metals, mining, packers, paper and pulp, public safety, public utilities, rubber, steam railroad, textile, women in industry and wood-working. In addition there are the general sessions and the round-tables where opinions can be voiced and general business transacted.

In the Public Utilities Sessions the following papers are being presented: "Preventing Accidents in Gas Plants" by J. F. Conner, "Inspection of Plants of Gas Companies" by Alvin E. Bliss, "Effective Means of Focusing the Responsibility for the Prevention of Accidents upon Foremen" by J. W. Easley, General Discussion, Questions and Answers, "Working Safely on Live High-Tension Lines" by H. J. Burton, "Practice of Operators and Tagging of Switches, Markings and Barriers" by Walter Wagner, "Spasmodic Safety Efforts and the Harmful Results" by H. M. Webber.

Commercial Practice

Turning Complaints Into an Asset—What One Utility Did Toward Closing Isolated Plants — Boston Flat Iron Sales

TURNING COMPLAINTS INTO AN ASSET—THE SMILING COMPLAINT MAN.

Excerpts from Paper Before Southeastern Section, N. E. L. A.

In a very able paper entitled "The Smiling Complaint Man" read before the Southeastern Section of the N. E. L. A. at their convention at Asheville, N. C., during the middle of last month, J. Prince Webster gave some good advice on how a utility may capitalize complaints, making them into an asset instead of a liability. To quote:

"Who, where and what represents your point of contact with the public? Is that point of contact sharp pointed—hard; or is it well oiled and greased and non-friction producing? The public, whose servant you are, forms its opinion as to the kind of servant you are from its point of contact with the company, with the employes of the company who it comes in contact with, and the public will let its complaints be known to and through such employes. Many small and trivial complaints, made by the public, are received with equally small and trivial attention, and the public goes on from day to day feeling that its complaints are not received with that degree of seriousness that attaches to the mind of the party making the complaint.

"Complaints, when made and received, should be received pleasantly, considerately and thankfully. The party to whom complaints are addressed should be courteous, conciliatory and helpful. Your average customer does not know the president of the company, the vice-president, the board of directors or other executive officials of the company, nor does he care who they are, but he does know the troubleman, your lineman, your cashier, your bookkeeper, your complaint man and such other of your employes as he comes in contact with; and it is by the conduct of these people that he does know the company, and it is by his contact with these people that the reputation of the company in the community is established—that is good or bad.

"Is your reputation in the community you serve good or bad? If it is not satisfactory to the public, not to you, then educate your points of contact with the public to the performance of their full duty to the public.

"The public is generally concerned only as to the character of service that you render, and embraced within the character of service rendered is, of course, the manner in which the public is handled and treated by your employes." Mr. Webster then went on to state that not more than 10% of the people who felt they had complaints to make made them, according to his experience with the U. S. Railroad Administration. It is important therefore that what complaints are made should be handled tactfully, that those making the complaints be shown courtesy and that their complaints be met and considered. He then went on to say that public relations could frequently be improved by more careful handling of complaints, thus bringing about a more satisfactory financial result to the company furnishing the service. A number of examples of different ways of handling complaints were presented, with their conclusions and morals.

"Which foot do you start out on in the handling of complaints? Is the company always right from the beginning, or is the customer sometimes right?" asks Mr. Webster.

"Satisfactory and friendly handling of complaints is one of the biggest assets a public servant has. The good will, aye, the good word spoken, as to the company's fairness in handling complaints means ever so much to the company; it increases the morale of its employes; it encourages growth in the community; it means sympathetic consideration in supplying increased revenue to meet increased costs of operation—all of which are vitally necessary in the successful operation of a public utility.

"Don't compromise just complaints and feel that you have served the company's interest; let the complainant himself suggest the solution and then gladly and freely and in a friendly way accept his decision; it means a friend in the community, a booster for the company's fairness; and additional money in the till at the end of the year.

"In conclusion: Make another study of your points of contact with the public; see if you have a friendly and smiley man or woman properly inoculated with the public point of view, handling your complaints; if you have not, make transfers until you do get one, and do it promptly.

"Receive complaints with a smile and with sympathetic consideration. Thank people for affording you an opportunity of making specific and special investigation as to matters affecting the operation of your organization. Assure them that their complaints will be handled promptly—then see that such handling is made.

"Don't compromise just complaints—go the whole route, and lastly lay all your cards on the table—face up—in explaining the result of your investigation; accept censure when due and promise to remedy the situation—then do so.

WHAT ONE UTILITY HAS DONE TOWARD SHUTTING DOWN ISOLATED PLANTS.

Experiences of Louisville Utility Make Interesting Reading.

Large electric light and power organizations continue year after year to increase their business at a rate far in advance of the growth of population and local industries. Just why this process should take place is not entirely clear to many observers and investors. The cause lies in the continuously multiplied uses to which electricity is being put as the result of its time, labor and money-saving abilities. There is

no factory, industry, business house, municipality or residence in which a need for electric service does not exist.

A large part of the increased business still comes from the closing down of isolated, or individually operated power and lighting plants. What this means to the electric companies throughout the country, and how it comes about, is graphically illustrated by giving the facts over a period of years in an American city of about 250,000 population.

In 1913 the several electric companies which were operating uneconomically for themselves and the public in Louisville, Kentucky, were consolidated under Byllesby management. Louisville is a city of many small manufacturing enterprises and none of predominating size. Due to the activities of the Louisville Industrial Foundation 27 new industries were brought to the city during the last few years, and they are obviously, all users of electric service.

In the six years ended with June, 1919, the service of the Louisville Gas & Electric Co. was substituted for 91 previously established isolated and industrial steam-operated power plants. The amount of power business thus added to the central-station company was in round figures 18,000 hp., and the lighting business from these sources, 2000 hp., or an aggregate of 20,000 hp. transferred from 91 individually operated plants, to the large, modern power house of the company.

Of the 91 isolated plants closed down 11 were located in downtown office buildings and stores, the city hall, etc.; three were operated by railroads, four by tanneries, 18 by woodworking establishments, nine by tobacco companies, 8 in machine shops, four by flour and grain mills, two in brick and tile plants and 32 were in miscellaneous industries, including woolen and cotton mills, chemical and food products plants, soap factories, etc.

Reviewing the work of the commercial department of the Louisville Gas & Electric Co. in the conversion of steam plants to central station service, Walter D. Myers, sales engineer, states that many important questions have been settled once and for all time in favor of the centralized service. With reference to office buildings, municipal buildings and power plants serving a restricted district, Mr. Myers says they were all located in the heart of the city, with fairly well equipped direct-current plants, all supplying steam for building heating purposes. Three of the office buildings were equipped with hydraulic elevators. These obstacles had to be overcome:

(1) Changing equipment (fans and motor) to alternating current;

(2) Prove that the building could be heated and electric needs bought at a cost not to exceed the cost of operating power plant;

(3) Replace hydraulic elevators with electric elevators or install motor-driven pumps to replace steam-driven pumps. In either case the installation was expensive.

Mr. Myers says, "The second disadvantage was the most serious to handle, as to a building manager, the heating of an office building is an enigma, especially when he has been led to believe by his steam engineer that his plant is primarily a heating plant and that the electricity needed to light the building is merely a by-product and costs the management practically nothing.

"This was overcome to a great extent by obtaining the cost of heating similar buildings that were purchasing electric service from the outside, but in some instances this evidence was not sufficient, and on one of the largest plants the yearly expense for lighting and heating the building was estimated and a clause inserted in the contract that if the first year's bill exceeded a given amount the customers were to have the privilege of cancelling the contract. The result was that the building exceeded the estimate about $300.00 per year, but the management was so well satisfied with the superior service that they would not consider re-establishing the old service.

"Little trouble was experienced in changing over the plants of the three railroad companies, as their experience in operating plants, not only in Louisville, but at other points, brought them to the conclusion of purchasing electricity where it is available at reasonable rates.

"With few exceptions the Louisville tanneries are confined to the tanning of sole leather, and steam in large and consistent quantities is used for drying. From the standpoint of economy in plant operation compared with purchased service, the power company was at some disadvantage, but, with increased output and relief from power-plant troubles, the tannery customers are well satisfied with results.

"Wood-working is one of the principal Louisville industries, and is generally conceded, with its waste fuel and demand for steam for dry kilns, a problem for central stations but efforts were centered on two or three of the largest plants at first and the business secured on short-term contracts. Their experience and satisfaction permeated the whole industry, with the result that the power company is now operating 90% of the wood-working plants in Louisville."

BROOKLYN EDISON CONDUCTS MOST SUCCESSFUL IRON SALE.

Sells 2004 Irons in 26 Days of August, Breaking All Previous Monthly Records in This Line.

During the month of August of this year the Brooklyn Edison Co. conducted one of the most successful sales of electric irons ever put on in Brooklyn, N. Y.—2004 irons being sold in 26 working days, an average of over 77 orders a day.

The iron offered was of a well-known manufacture with the name-plate "Brooklyn Edison Special," and was sold at $4.98—$2.98 down and $1.00 a month to Brooklyn Edison customers.

Over 60,000 return postcards were sent out with the monthly bills to lighting customers and very satisfactory returns were received. In addition, each branch-office window was specially decorated where actual demonstrations were conducted throughout the entire month.

Two-column advertisements in preferred positions were carried periodically in all of the Brooklyn newspapers and local publications.

The lighting salesmen of the company were allowed a commission of 25 cents per order taken as an incentive. The illuminated billboards of the company were used as well as the billboards at the Brooklyn National Ball Park. All of the company's wagons carried a single sheet poster announcing the sale. These posters are most effective, inasmuch as they attract the attention of new customers. When a wagon drives up to the door to deliver material, such as meters, lamps, etc., the customer usually notices this advertisement on the wagon.

During September the Brooklyn Edison special is an electric washing machine on easy terms.

Operating Practice

Boiler-Room Instruments — Field Coil Troubles — Simple Location of Faults — Insulator Failure and Deterioration

BOILER INSTRUMENTS OF COUNTIES GAS & ELECTRIC CO.

Instruments Found Justified on Boilers of 520 B-Hp.

The Counties Gas & Electric Co., Norristown, Pa., applied to its boiler room its ability along efficiency lines to a greater extent than in other industries, but when the cost of coal soared during the war it concentrated its efforts toward greater efficiency. So when they built their new plant with an ultimate capacity of 53,000 kw. with an initial capacity of 17,250 kw. and containing 13 boilers of 5420 b-hp., they adopted the best modern methods in the way of equipment.

Some engineers maintain that it is only the largest plants that can install complete boiler-room instruments and find it financially worth while. But in a paper on "Economical Boiler Room Practice for Medium Size Plants" read before the Pennsylvania Electric Association, Henry B. Bryans, chief engineer of the Counties Gas & Electric Co., stated that the company aims to operate at about 200% rating at all times and 300% rating during peak loads. Each of his boilers has been equipped with the following equipment with good results:

1. Recording indicating steam flow meter.
2. Recording CO_2 meter.
3. Indicating gauge for determining pressure in wind box.
4. Indicating gauge for determining pressure over the fire.
5. Recording flue gas pyrometer at entrance to economizer.
6. Recording flue gas pyrometer at discharge from economizer.
7. Recording thermometer for feed water entering economizer.
8. Recording thermometer for feed water leaving economizer.
9. Automatic feed-water regulators.
10. Balanced draft control.

ACID FUMES CAUSE INSULATION DETERIORATION.

Storage Battery Ventilation, Defective Cause of Insulation Troubles.

By B. H. Smith.

A 1000-kw. synchronous motor driving a 1000-kw. three-phase generator was employed for changing the frequency of one system from 25 cycles to 60 cycles, thereby enabling the 25-cycle and the 60-cycle systems to interchange power between them.

The 1000-kw. motor operated at 9000 volts, and was called into service for about eight hours daily during the fall and spring, about four hours during the summer and about ten hours during the winter months. This synchronous motor had developed a sprung shaft thought to be due to previous step bearing trouble (the unit was of the vertical type). The entire unit vibrated considerably, especially with sudden load changes.

A certain amount of trouble was occasioned from time to time on account of the insulation on the field pieces breaking down and grounding the field circuit and short-circuiting the field turns as a result. Repairs had been made several times, but the trouble persisted in recurring. The reason for the insulation trouble in the field circuit was given as being due to the vibration resulting from the bent shaft.

However, it so happened that the writer visited the station containing this frequency-changer while it was down for repairs, some of the field poles having caused trouble again. An examination of the seat of trouble showed that the insulation showed none of the typical signs of abrasion or mechanical injury such as one would expect to find where the insulation trouble was due to the incessant shock or small knocks accompanying continual vibration. Instead, the insulation appeared to be somewhat discolored, the signs of moisture seemed to be present, although not in sufficient quantity to permit the statement to be made that the insulation was damp.

It now appeared that the previous diagnosis of vibration as being the cause of trouble might be wrong. Moisture was suggested as the cause. As no source of moisture could be found, oil was suggested, but the insulation had no appearance of being oil soaked. On holding some of the insulation close to the nose the writer discovered a slight odor of sulphuric acid, and that acid was present was later found to be correct by the use of litmus paper.

The cause of the failure of the insulation on the field of the synchronous motor was that sulphuric acid was able to collect on the insulation. The frequency-changer was a vertical machine. In the basement alongside the step bearing of the unit was a storage battery used for operating the switchboard, circuit breakers and emergency station lighting. This battery was housed, but the housing was not in good condition. The ventilating shaft had corroded to such an extent that instead of the acid fumes being carried off through the ventilating duct to the outside of the building, they had been sucked through the corroded holes in the shaft by the windage that occurred when the motor-generator was in operation.

The field of the motor, being the rotor and occupying the most exposed position for the fumes, was attacked most rapidly by the acid. It would doubtless have been only a matter of time before the insulation of the stator would have broken down also, although this would have taken longer, because of the heavier insulation and the more general application of insulating compound employed for 9000-volt windings than for 220-volt windings.

The battery room was repaired. A draft tube or ventilating duct of more generous proportions replaced the corroded and defective one, and all further trouble

has apparently been prevented. It would seem that special care should be taken that storage battery rooms are located in places where the acid fumes can be readily carried off in a most direct manner, and that leakage of fumes and the presence of drafts that would tend to suck the fumes out of the battery room through cracks, leaks, etc., should be avoided. Where space does not permit choice of battery room location, suitable lagging can be employed to prevent the escape of acid fumes into the station.

LOCATING FAULTS IN UNDERGROUND CABLES.

Abstract of Article in Elektrotechnische Zeitschrift.

A method of fault location in underground cables that has been employed successfully in a large network in East Germany for the last two years permits one man locating trouble quickly and simply. By its means the location of the fault may be made as a check against calculations or to locate the exact position of the fault.

In one case a fault was found in a cable in which there was complete breakdown, and in another the case was that of a cable lying in 30 ft. of water. It was also used on other cables, and there was a notable success on two occasions on a direct-current cable which broke down twice at distances 150 ft. apart; in both cases the precise position of the fault was located. Many engineers still employ the plan of cutting the cable to find the defective part; others open some of the joints; all this is unnecessary.

When there is not a complete interruption in the cable, the method can be used in the following cases without interrupting the supply: (1) In polyphase systems without an earthed neutral if one phase is earthed; (2) in direct-current two-conductor systems, unless one of the conductors is uninsulated, and (3) with direct-current three-core cables, if the middle conductor is insulated and can be grounded if desired. Case (1) can be dealt with without any difficulty; in cases (2) and (3) the defective conductor will require to be earthed through a resistance for a short interval.

In the original article a diagram of connections is given. One pole of a direct-current generator is connected to the defective conductor, while the other can be connected to earth. If the circuit to earth is closed, then the current to earth passes through the armouring on both sides of the fault; a needle galvanometer is now connected in the circuit; it should have its sensitiveness properly adjusted, and should show deviations on both sides of the zero point. The direction of the throw and also its amount should be noted. If the positive pole is earthed, the negative pole of the instrument points towards the fault. When the position of the fault is entirely unknown, the observer proceeds by halving the defective length at each successive test. For instance, over a length of 1000 yards, it would probably be necessary to test at seven different points.

A special clamp consists essentially of a V-shaped grip which is passed beneath the cable. The grip is held at the end of a length of tube, through which a sharply-pointed rod can be fed forward by a screw device, which is clamped to the tube. As the pointed rod is fed forward through the grip, it penetrates the jute covering, and makes contact with the armouring of the cable. In this way a steady contact for the purpose of the test is obtained.

OBSERVATIONS AS TO INSULATOR FAILURE AND DETERIORATION.

Abstracts from Paper Before Pacific Coast Section, A. I. E. E.

As the result of the failure of insulators, much attention is now being given such matters as mechanical and electrical design, the investigation of ageing, the influence of mechanical and electrical stresses and climatic conditions upon different types of insulators and the same insulators under different sets of conditions. In a very able paper delivered before the A. I. E. E. in Los Angeles recently, L. M. Klauber discussed the theory of probabilities applied to failures of suspension insulators, pointing out the influence of factors of safety upon the probable reliability of a transmission line and its probable immunity from insulator troubles.

Mr. Klauber pointed out that although nearly every insulator failure is finally a flash-over there is little practical difficulty in differentiating between the two types of failure. The flash-over due to deteriorated line conditions shows a heavy foreign deposit on the insulator surface. In almost every case the bottom member of the string will be shattered; often the top member also, but rarely an intermediate member. Unbroken units will before cleaning give a zero reading with a megger and a very low flash-over with a high potential test. Subsequent to cleaning, however, unless badly burned by the power arc, they will give as high a megger and flash-over test as when new. Lines subject to difficulties of this kind cannot be tested with a megger in the field even on a clear, dry day, unless each unit is wiped off before test.

In the other type of failure occurs the fundamental condition that a number of units have failed by material depreciation (usually puncture) and the balance being unable to hold the line have subsequently flashed-over. The characteristic differentiating this class of failure from the former is the number of punctured units which occur at random throughout the string. Even if subsequently shattered by the power arc they may usually be readily distinguished from units shattered by the other type of failure.

In testing and renewing insulators on the line it is desirable that results be recorded in detail. The distribution of failures between strings, their location in different sections of the same line and the relative frequency of failure of units in corresponding positions in the string, all will be of interest in deducing the causes of failure. It is desirable to know whether bottom, top or intermediate units fail most frequently, and in what ratio; whether units in greater tension at dead-ends fail more frequently than those in suspension; whether units with bolts exposed to the direct rays of the sun fail more frequently than those on the same tower but with bolts toward the north and consequently protected from the sun by the porcelain shells. It is of interest to note whether failures follow hot spells, whether they are decreased by cleansing rains and other effects of the weather. If lines operating under similar conditions contain units differing in manufacture, it is of course important to determine separately the percentage of failures for each type. Also by noting the relative frequency of single and multiple failures, it is possible to determine whether failures follow the laws of probability for purely independent events, as above outlined, or whether successive unit failures are to a certain extent dependent events.

Contracting-Construction

Exit Sign and Emergency Lighting — Device for Signaling Stoppage of Motors—Changes in National Safety Code

RULES FOR WIRING EXIT SIGN AND EMERGENCY LIGHTING.

Revised Chicago Electrical Code Gives Complete List of Specifications for Wiring All Kinds of Buildings.

In connection with the rules governing the wiring of theaters, assembly halls, hotels and other buildings, the Department of Gas and Electricity of the city of Chicago has in the 1919 edition (just published) of its electrical code prepared a table specifying the kind of exit sign lights and emergency lighting systems required for different kinds of structures. It is probably the most complete specification for exit and emergency lighting that has ever appeared. Following is the table with explanation of the symbols:

Apartment buildings (three stories or more in height)		F
Asylums (more than ten persons and more than two stories high)	A-2	C
Assembly halls	A-1	E-1 and E-2
Banquet halls	A-1	E-1 and E-2
Billiard rooms and bowling alleys	A-1	E-1 and E-2
Churches	A-1	E-2
Clubhouses (less than 20 persons and more than four stories high)	A-2	B
Clubhouses (20 or more persons and more than two stories high)	A-1	C
Dance halls	A-1	E-1 and E-2
Department stores (more than two stories high)	A-2	B*
Dwellings	None	None
Expositions	A-2	E-1 and E-2
Factories (more than two stories high)	A-2	B
Garage (more than two stories high)	A-2	B**
Gymnasiums (if sleeping accommodations for 20 persons or more, and more than two stories high)	A-2	C
Gymnasiums (in buildings containing no assembly hall)	A-1	E-1 and E-2
Gymnasium (in buildings containing assembly halls)	None	None
Homes for aged or children (more than ten persons and more than two stories high)	A-2	C
Hospitals (more than ten persons and more than two stories high)	A-2	C
Hotels (20 or more persons and more than two stories high)	A-2	C
Infirmaries (more than ten persons and more than two stories high)	A-2	C
Jails (more than ten persons and more than two stories high)	A-2	C
Libraries (more than four stories high)	A-2	B
Lodge halls	A-1	E-1 and E-2
Lodging houses (20 or more persons and more than two stories high)	A-2	C
Moving picture theaters—(See Theaters)		
Office buildings (more than four stories high)	A-2	B
Parish halls	A-1	E-1 and E-2
Police stations (more than ten persons and more than two stories high)	A-2	B
Residences	None	None
Rooming houses (20 or more persons and more than two stories high)	A-2	C
Skating rinks		
Schools (more than 100 students)	A-2	C
School halls (in school, building)	A-1	C
School halls (in separate building)	A-1	E-1 and E-2
Stables (more than two stories high)	A-2	B**
Stores (other than department stores, more than three stories high)	A-2	B
Theaters (regular theaters)	A-1	D
Theaters (not more than two sets of scenery and not more than 300 seats)	A-1	C
Theaters (not more than two sets of scenery and more than 300 seats)	A-1	D
Theaters (moving picture theaters with not more than 300 seats)	A-1	C
Theaters (moving picture theaters with more than 300 seats)	A-1	D
Warehouses	None	None

Note.—Any floor six inches below the surface level is considered as a basement.

(A-1) Emergency lighting system of gas or electricity in all halls, corridors, stairways or other means of exit, which shall be independent of all other lights. Separate meter and service switch and, on overhead services, separate service to outside of buildings. Lights to be controlled only in lobby. Lights shall be kept burning until audience has left building.

(A-2) Emergency lighting system of gas or electricity in all halls, corridors, stairways or other means of exit, which shall be independent of all other lights. Separate meters, and service switches, but service may be connected to mains inside of building. Lights must be controlled only at some point near the main entrance. Lights must be kept burning until the occupants have left the building.

Note.—Emergency lighting system must be electric where electricity is used for general illumination.

(B) Exit signs illuminated by gas or electric light.

(C) Exit signs illuminated by gas only. (Electric not permitted.)

(D) Exit signs illuminated by both gas and electricity. The electric lights must be connected to the emergency lighting system.

(E-1) Where auditorium is used for theatrical whether regularly or occasionally, and where the seating capacity is not more than 300, exit signs must be illuminated by gas; if more than 300, must be illuminated by both gas and electricity.

(E-2) Where not used for theatricals and where the seating capacity is not more than 400, exit signs must be illuminated by gas or electricity. Where the seating capacity is more than 400 exit signs must be illuminated by gas.

(F) Lights must be installed on each floor and in vestibule of public halls and must be so arranged as to thoroughly light the same. If the building is wired for electric light these lights should also be electric. They must be connected to separate circuits carried to cutout box and connected to owner's meter or to a separate meter. Lights must be kept burning from sunset to sunrise.

* Illuminated signs must be provided showing the number of the floor.

** Any building more than two stories high having a garage or stable on the first floor, exit signs must be illuminated by electricity; gas not permitted.

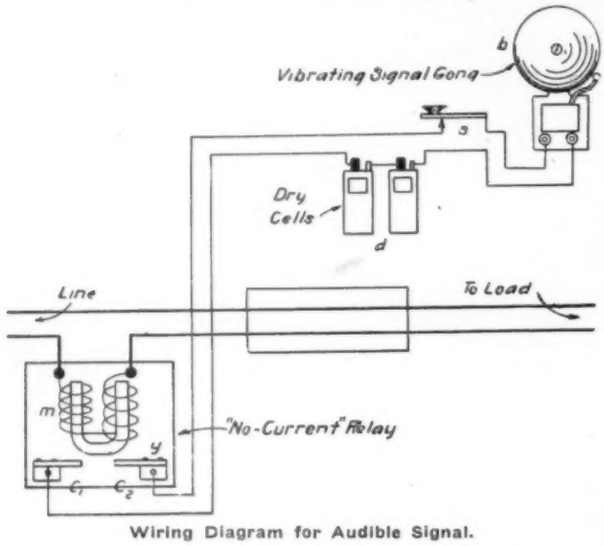
AUDIBLE SIGNAL TO INDICATE DISCONTINUANCE OF LOAD.

By Richard L. Dyke.

It is very often essential in industrial plants that certain motors or groups of motors be operated as continuously as possible. In such cases it is very

desirable that the plant electrician or repair man be notified very quickly in the event of any trouble occurring that stops the motor. For this purpose the device shown in the accompanying sketch will prove very useful. By installing this device an audible signal will be sounded as soon as the current in the motor circuit drops off. It can also be used to indicate a shutdown on motors operating in places where nobody is working or watching.

In the sketch the signal is arranged so that a bell will ring when a group of motors in a distant building is stopped. Fig. 1 indicates the connections. A relay, *M*, was made and connected to the circuit which supplies the load. When the load is taking current through the line *L*, the magnet coils of *M* have current in them and pull up the U-shaped yoke *Y*. But when the load is discontinued, *Y* drops down and makes contact to cross C_1 and C_2. This closes the electric-bell circuit and causes *B* to ring. And it will continue to ring until switch *S* is opened. A large



Wiring Diagram for Audible Signal.

number of turns is not required on the magnet coils, *M*, as their function is merely to hold up the yoke *Y*. It is not, in most cases, necessary that the magnet coils be sufficiently strong to pull up *Y*, because it can be raised by hand. The wire used for the magnet coils, *M*, must be of sufficient size to carry the full-load current in the circuit.

PROPOSED CHANGES IN PART I, NATIONAL ELECTRICAL SAFETY CODE.

Revision Now Under Way Provides for Minor Changes in Safety Rules for Power Houses and Substations.

As previously announced, the National Electrical Safety Code is being revised by the Bureau of Standards, Washington, D. C., prior to publication of a new edition of this code. Part III, covering rules for installation of utilization equipment, has already been revised. A tentative revision of Part I—rules for the installation and maintenance of electrical supply stations and equipment—has been made, but has not been adopted; an opportunity is now offered to central-station engineers, contractors and others interested to submit constructive criticism of the revised rules prior to their adoption in the near future. A similar revision has been made of Section 9 of the Safety Code, including rules for methods of protective grounding of circuits, equipment and lightning arresters, and this is also open to such criticism. Copies of the tentatively revised Section 9 and Part I have been sent to all parties thought to be interested.

Most of the changes are not radical, but are intended to cover points which were previously omitted or which seemed to need clarification. Slight rearrangements to make a more logical grouping of the rules have also been made. The following are abstracts or the actual wordings of some of the more important new rules of Part 1; (matter in small type gives the actual wording of changes, while the larger type gives abstracts). It should be noted that these are not final, but only in tentative form.

PRINCIPLE PROPOSED CHANGES IN PART I.

Rule 104 (a)—Electrical apparatus and machinery rooms must be equipped for adequate artificial illumination available at all times.

106 (f) and (g)—Steel stairways and ladders must be suitably guarded.

108 (a)—Fire extinguishers shall not be installed in locations subject to high temperatures, unless specially designed for same.

108 (b)—Floors of galleries and rooms containing oil-filled switches and apparatus shall be drained and provided with oil gutters.

136. MOTORS—

(a) *Wiring Motors Below 750*—Motors operating at a voltage of 750 volts or less must be wired with the same precautions as required for industrial wiring carrying the same current.

(b) *Protection of Wiring Over 750 Volts*—All apparatus and wiring connected to circuits over 750 volts must be completely inclosed in substantial metal shields or casings and the conduit must enter and be properly secured to such casings or to suitable terminal boxes screwed or bolted to the casings. Shields, casing and conduit must be grounded as provided in Section 9.

The insulation of the several conductors for motors of over 750 volts where leaving the metal sheath of cables, must be thoroughly protected from moisture and mechanical injury. This may be accomplished by means of a pothead or some equivalent method. The conduit must be substantially bonded to the metal casings of all fittings and apparatus connected to the inside circuit. Except where exposed to moisture a metal sheath need not be provided over splices, but the ends of the sheaths must be belled out and sheaths must be bonded around splices by copper wire not smaller than No. 6 A. W. G. and suitable ground clamps.

(c) *Motors in Dusty Places*—Inclosed-type motors are recommended in dusty places, being preferable to wooden boxing.

(d) *Drip Pans*—Where practicable, motors permanently located on wooden floors must be provided with suitable drip pans.

144. *Apparatus with Oil*—Transformers, induction regulators and other electrical apparatus containing an appreciable amount of oil, when installed indoors shall be installed in fireproof inclosures, not having any doors or windows in such a position that burning oil could pass through them on to material or apparatus of a more or less inflammable nature. The inclosures themselves shall not contain any material or apparatus which could take fire from burning oil.

Where such apparatus is installed on a balcony or gallery above other apparatus a gutter or other means for draining off oil or preventing it from running down on to lower floors shall be provided.

Where such apparatus is installed outdoors, adjacent walls shall be of fireproof material and shall not have any doors or windows in such a position that burning oil could pass through them on to material or apparatus of a more or less inflammable nature. Material or apparatus outdoors which could take fire from burning oil shall not be placed within 25 ft. of the apparatus in question.

See Rule 108 (b) for requirement for oil gutters in connection with apparatus containing oil.

145. GROUND DETECTORS—

(a) *Where Required*—All circuits, except such as are permanently grounded as provided in Section 9, must be

provided with reliable ground detectors. Detectors which indicate continuously and give an instant and permanent indication of a ground are preferable. Ground connection must be made as provided in Section 9.

(b) *Electrostatic Detectors*—Electrostatic ground-indicating devices shall be properly protected and be provided with a metallic shield if used on switchboards or near instruments.

150. (d) *Circuits Exposed to Higher Voltages*—If exposed through transformer windings, circuits below 750 volts shall be grounded unless everywhere in grounded conduit or other suitable duct or identified and guarded as required for conductors of the highest voltage to which they are exposed.

151. (d) *Lead Sheathing and Potheads*—Conductors between generators and outside lines shall be in plain sight and supported on approved noncombustible, nonabsorptive insulators or placed in approved metal conduit, tile or other fireproof ducts. Conductors installed in conduit or ducts where exposed to moisture shall be sheathed and the sheathing shall be grounded. Except for systems below 300 volts to ground the insulation of the several conductors where leaving the metal sheath of cables shall be thoroughly protected from moisture and mechanical injury by means of a pothead or some equivalent method.

(e) *Conductors Not in Conduit*—Conductors between generators and outside lines shall, where not in conduit, be kept so rigidly in place that they cannot come in contact. Where they pass through floors or fire walls they shall be carried through individual openings in fire-resisting insulating tubes or their equivalent and not through a common open space.

(f) *Protection Against Excessive Temperatures*—Wherever insulated conductors are exposed to excessive surrounding temperatures, a special protection shall be provided if the maximum temperature exceeds the maximum safe limiting temperatures adopted in the Standardization Rules of the American Institute of Electrical Engineers.

156—Wiring for illumination of the station or other utilization purposes should be installed as required for similar utilization equipment and conductors in Part III of the Safety Code.

157 (b)—During alterations or extensions to a station in service, equipment and apparatus exposed to weather, dirt, etc., shall be suitably shielded against same, and also made inaccessible to unauthorized persons or installed as per rules of Part III for equipment accessible to such persons.

161. LOCATION OF OIL SWITCHES. (See Rule 103 for hazardous locations.)—

(a) *Isolation*—Oil circuit-breakers and switches shall wherever practicable be isolated from other switches and electrical apparatus. On circuits of over 7500 volts they must be of remote-control type and be inclosed in separate fireproof cells or compartments.

(b) *Indoor Inclosures*—Oil switch or oil circuit-breakers when installed indoors shall be installed in fireproof inclosures, not having any doors or windows in such a position that burning oil could pass through them onto material or apparatus of a more or less inflammable nature. The inclosures themselves shall not contain any material or apparatus which could take fire from burning oil.

(c) *Drainage on Galleries*—Where oil switches or oil circuit-breakers are installed on a balcony or gallery above other apparatus, a gutter or other means for draining off oil or preventing it from running down onto lower floors shall be provided.

(d) *Outdoors*—Where oil switches or oil circuit-breakers are installed outdoors, adjacent walls shall be of fireproof material and shall not have any doors or windows in such a position that burning oil could pass through them onto material or apparatus of a more or less inflammable nature. Material or apparatus outdoors which could take fire from burning oil shall not be placed within 25 ft. of the switches or circuit-breakers.

164. (c) *Air-Break Disconnector*—An air-break switch or air-break disconnector shall be inserted in each conductor between electrical supply equipment or lines and sources of energy of over 5000 volts, if the equipment or lines may have to be worked on while the sources may be alive.

165. WHERE AUTOMATIC CUTOUTS ARE REQUIRED—

(a) Constant-potential generators, except alternating-current machines and their exciters, and transformers, or station auxiliaries shall be protected from excessive current by suitable automatic cutouts, except as noted below and in Rule 150.

For two-wire direct-current generators, single-pole protection will be considered as satisfying the above rule, provided the automatic cutout is so located or arranged as to be actuated by the entire generator current, and the action thereof will completely open the generator circuit.

(b) *Generators Not Electrically Driven*—For a generator not electrically driven supplying a two-wire grounded system, the automatic cutout shall be so placed as to disconnect the generator from all conductors of the circuit.

(c) *Generators Used with Balancer Sets.*—For two-wire direct-current generators used in conjunction with balancer sets to obtain a neutral for three-wire systems, an automatic cutout shall be installed, which in case of an excessive unbalancing of voltages will operate to disconnect the three-wire system.

(d) *Three-Wire Generators*—For three-wire direct-current compound or shunt-wound generators, an automatic cutout, other than a fuse shall be placed in each armature lead, and so connected as to receive the entire current from the armature. The automatic cutout shall consist of either: (1) a double-pole double-coil, over-load circuit-breaker, or (2) a four-pole circuit-breaker connected in the main and equalizer leads, and tripped by means of two overload devices, one in each armature lead.

These automatic cutouts shall be so interlocked that no one pole can be opened without simultaneously disconnecting both sides of the armature from the system.

(e) *Motors*—Motors shall be provided with cutouts and switches as required for motors in industrial installations by Part III.

170 (a) to (c)—Switchboards shall be so located as to reduce danger of communicating fire to adjacent combustible material. They shall not be built up to the ceiling, 3 ft. being left clear if possible. Spaces back of board must be kept clear and clean. If wired on the back, the board must be accessible on all sides.

180. LIGHTNING ARRESTERS—

(a) *Where Required*—Lightning arresters shall be attached to each wire of every overhead circuit connected with the station, except wires in cables with grounded lead sheath.

(b) *Indoors*—Lightning arresters, with auxiliaries, when installed inside of buildings shall be located well away from all other equipment, passageways and combustible parts of buildings. When of a type containing oil they shall be installed in fireproof inclosures not having any doors or windows in such a position that burning oil could pass through them onto material or apparatus of a more or less inflammable nature. The inclosures themselves shall not contain any apparatus or material which could take fire from burning oil.

(c) *On Galleries*—Where lightning arresters containing oil are installed on a balcony or gallery above other apparatus a gutter or other means for draining off oil or preventing it from running down onto lower floors shall be provided.

(d) *Outdoors*—Where lightning arresters containing oil are installed outdoors, adjacent walls shall be of fireproof material and shall not have any doors or windows in a position so that burning oil could pass through them onto material or apparatus of a more or less inflammable nature. Material or apparatus outdoors which could take fire from burning oil shall not be placed within 25 ft. of the arresters

184. (c) *Insulation of Attachments*—All choke coils or other attachments, inherent to the lightning-protective equipment, shall have an insulation from the ground or other conductors equal at least to the insulation demanded at other points of the circuit in the station.

ELECTRIFICATION OF RAILWAYS CONTEMPLATED IN FRANCE.

The French Ministry of Public Works is considering the question of adopting electric traction on French railways. A commission sent to this country to study railway electrification has recommended in a preliminary report the use of a 3000-volt direct-current system, such as that of the Chicago, Milwaukee & St. Paul railway.

BOOK REVIEWS

"Boiler Chemistry and Feed Water Supplies." By J. H. Paul. New York: Longmans, Green & Co. Cloth, 242 pages (8½ by 5½ ins.), with numerous illustrations. For sale by Electrical Review Publishing Co., for $4.50.

The properties of water used in boilers have always had an important bearing upon the safety and life of boilers; likewise upon their performance and efficiency. However, the chemistry of water has become of even more vital importance of recent years as higher steam pressures came to be employed, because of the higher temperatures involved and the greater opportunity offered to scale to become a hazard and to jeopardize efficiency. Boiler chemistry, by which is meant the chemistry that deals with the water entering the boiler, the deposits that collect in the mud drums and on the heating surfaces of the boiler, and the treatment of water before it enters the boiler that it may be made suitable, has not received the attention that it deserves. It will, therefore, be with gratification that engineers hail an intensely practical book upon this subject by J. H. Paul.

"Boiler Chemistry and Feed Water Supplies," as its name implies, deals with the properties of water supplied to boilers, what to guard against, and how to guard against these things; it tells of many and varied instances and experiences with boiler feed-water. The book is divided into seventeen chapters on the following subjects: Earth, Air and Water; Acids, Bases and Salts; Constituents of Natural Waters; Scales and Deposits; Softening; Soluble Salts; Iron; Carbonic Acid; Concentration of Waters Containing Carbonate of Soda; Action of Carbonic Acid on Iron; Corrosion; Condensed Waters; Superheater; Priming; External Deposits; Failure of Clean Tubes; Water Supplies; Appendix—carbonic acid in London waters; Index.

A book dealing with any phase of chemistry cannot be devoid of chemical terms and expressions. On the other hand, such terms and expressions need be only a means to an end, and they can be so explained and simplified that they expound and amplify a fact instead of masking it in the mind of the layman and those not specially conversant with chemistry. This is apparently exactly what the author of this book has done. He has employed chemical expressions as only a means to an end. The explanation, in simple and straightforward language, is the chief consideration; chemical technicalities are secondary and are used only as a means to an end. The result is that the book is very practical, hence should go a long way toward clearing up many difficulties and misapprehensions in the minds of those engineers who "do not know chemistry" and of those brought into close touch with conditions and who, while appreciating the dangers and objections of impure water, have little time or inclination to work things out for themselves. To such men this book on "Boiler Chemistry and Feed Water Supplies" should prove to be a very real boon.

As the author states, "chemistry has improved the physical character of industrial iron and steel and rendered possible the use of the high pressures now employed in steam boilers, and an acquaintance with the reactions which take place in a boiler under modern working conditions will enable steam users to preserve their boilers from those evils which are roughly summed up in the expression, "scale and corrosion" * * * "any chemical knowledge which will increase its (the boiler's) efficiency, preserve its life and save coal deserves thought and consideration."

The book handles a technical subject in a very practical manner. That space is devoted to economizers, to condenser tubes, mud drums and steam traps should make many engineers realize that chemistry and their work are related. The engineer possessing and reading this book will be a better engineer, and undoubtedly be worth more to himself and to his employer.

"Electrical Engineering Papers." By Benjamin G. Lamme. Pittsburgh: Westinghouse Electric & Manufacturing Co. Cloth, 773 pages (9 by 6 ins.), profusely illustrated. Price $2.50.

Benjamin G. Lamme, chief engineer, Westinghouse Electric & Manufacturing Co., has been connected with this company since 1889, during which time he has taken a prominent part in this company's work and has been largely responsible for the position this company holds in the engineering world today. As appreciation of Mr. Lamme's thirty years of continuous service, the Westinghouse Electric & Manufacturing Co. has recently published a book entitled "Electrical Engineering Papers," being a compilation of the most valuable papers on engineering subjects written by Mr. Lamme.

The book contains 773 pages, every one of which is of educational value. The papers have been gleaned from many different sources but all are typical of Lamme, the engineer, the mathematician, the student of humanity.

The book is not offered as a substitute for any textbook now in use, but, as the name implies, is a collection of engineering papers. Some of these are classic now—for instance, the one on "The Polyphase Motor," originally delivered in 1897 before the Niagara meeting of the National Electric Light Association. That this is still authoritative on the rotating field and induction motor principles is evident by the fact that the United States Navy copied it into their recent textbook for the young engineers of the Navy to study. Many other papers appeared originally in the Transactions of the American Institute of Electrical Engineers.

All the papers or articles are classics and are models of straightforward thinking and expression and analytical study. They can be read with equal advantage by he who seeks to learn the technicality of the subject or he who seeks to learn freedom of expression, consecutive thought and concise expression.

ELECTRIC FLASHER FORMS PART OF WINDOW DISPLAY.

An effective method of selling electric sign flashers is being used by the Electric Construction & Sales Co., Cleveland, Ohio. The company has a large electric sign of its own on the front of the building. This sign is operated by a flasher which forms a part of the window display. The flasher is placed in a neat glass case at the front of the window space.

The fact that the flasher is in actual operation serves to excite the curiosity of passersby, and it is no uncommon sight to see a dozen people standing in front of the window who alternately watch the flasher and the work that it is doing.

While the display may not be the cause of many direct sales, it is undoubtedly of great value because it sells the idea of electric signs and flashers.

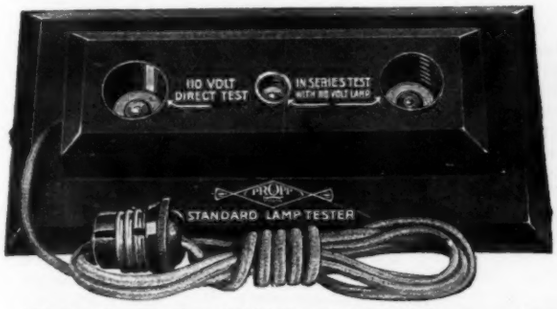
New Appliances

Portable Painting Outfit to Promote Economy in Paint and Painting—Handy Lamp Tester—Commutator Resurfacer

Propp Lamp Tester for Standard and Low-Voltage Lamps.

The dealer in lamps always likes to be sure that all lamps that go out of his establishment are intact, and the purchaser as a rule also appreciates, if he does not insist on, a test of each lamp as it is turned over to him. During the Christmas shopping rush there is always a big demand for Christmas-tree lighting outfits that in some dealers' stores almost overtaxes the capacity of the sales force. Consequently, every facility in selling is of special value at this time.

A special lamp-testing outfit has been developed for this purpose by the M. Propp Co., 108 Bowery, New York City. As illustrated herewith, it is of simple design, consisting of three lamp receptacles mounted on a board base and provided with cord and plug for conection with the 110-volt lighting circuit. The left receptacle is threadless for easy and quick direct testing of standard 110-volt lamps or of Christmas-tree series strings; in the latter case the plug of the set is merely inserted into the left receptacle. If the lamps do not all light, one or more of them are out of commission and each of the series lamps must be tested. This is done by putting them one by one into the middle receptacle, which is wired in series with the one at the right that is filled with a 110-volt lamp. In this way all lamp tests are very quickly and reliably made.



Device for Testing 110-Volt and Low-Voltage Lamps Quickly.

A Simple Commutator Resurfacer.

A very simple and inexpensive tool has been devised which is said to greatly reduce this continued expense and is daily proving its effectiveness in the plants of some of the largest industries. This appliance is known as the "Ideal" commutator resurfacer and consists merely of a manufactured block composed of special abrasive material and mounted on a metal backing provided with a handle.

When motors or generators show sparking at the brushes, the device is applied as a resurfacer while they are in service and under full load. By means of the handle it is held with a slight pressure against the revolving commutator or collector ring until the abrasive surface has cut down ridges and rough spots and entirely eliminated the sparking caused by the rough surface. Unless a commutator or ring is in extremely bad condition, a few minutes' work with this device will correct this trouble.

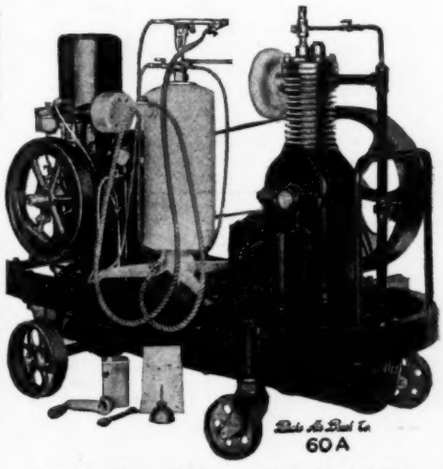
One of the features in the construction of the "Ideal" resurfacer is its uniform density. It being a manufactured article, the cutting surface is always uniform. The manufacturer, the Ideal Commutator Dresser Co., Chicago, has expressed its confidence in the device by a liberal ten-day free trial offer.

Paasche Napsack Painting Outfit.

Portable Painting Equipment Saves Time and Money.

With present high labor costs and the beginning of delayed building activity, special interest attaches to the Paasche air brush and portable painting equipment. The product of this company enables one man to do the painting ordinarily requiring the employment of four, six and even eight men using a hand brush; moreover, the work is done better and with less paint than when done by the old-fashioned method. Surfaces painted by the Paasche apparatus thus cost less to paint and require less frequent painting.

The Paasche outfit consists of an air brush, an air compressor, an air tank and engine or motor for driving the compressor (or hand pump as the case may be) and a length of flexible hose, and the various control mechanisms for manipulating the supply of paint, the pressure of air, etc. There are several different types of equipment, all embodying the same general principles, and depending upon whether one or two different colors of paint are used; the capacity of the unit, in gallons; and whether it is necessary that the entire outfit be moved or only part of it, which means according to the kind of work to be done. There is a type for every form of work and some of them are entirely enclosed against dirt and rain. In some of the types engine, compressor, air tank and paint drums are installed upon one portable truck. In others each of the fundamental units are mounted separately upon individual trucks. In yet other types the paint drum can be strung upon a man's back, like a knapsack, a convenient arrangement where the surfaces to be covered are difficult of approach, as smoke stacks and similar places; this outfit, complete with 6-ft. of hose, 3-gallon paint tank and fittings, weighs only 18 lbs. Still another outfit specially designed for painting smoke stacks, tanks, and large surfaces elevated above ground, where scaffolding would be ordinarily required, is fitted with safety block and tackle and all necessary equipment for moving up and down safely. This is a very compact unit and consists of seat, 50-ft. of air-line hose, tackle and tanks.



Paasche Portable Painting Outfit for Two Painters.

The Paasche painting equipments have been developed specially for painting efficiently such surfaces as walls, stucco houses, steel surfacees, brick buildings, structural work of all kinds, bridges, trucks, stacks, ships, etc. It can be used for finishing and general painting as well as for calcimining. It is being used by some of the largest steel manufacturers, including the Carnegie Steel Co., the Duquesne Steel Co., and others. Twelve Paasche equipments have recently been ordered by the Government for painting the forty large steel buildings that are now being erected at Savannah, Ill., for returned equipment.

Wherever and whatever is to be painted can be done quicker, better and cheaper when done the Paasche way than when done any other way, is the claim of the Paasche Air Brush Co., Chicago, who cite instances where men with only one arm have replaced several able-bodied men.

Lately Approved Appliances

Underwriters' Laboratories, established and maintained by the National Board of Fire Underwriters (for service—not profit), have examined, tested and listed these electrical appliances in accordance with the Laboratories' Code for Construction and Test of Electrical Appliances. Copies of complete lists of standard appliances may be obtained from local inspection departments or from offices of the Laboratories in the principal cities.

Fixture for Use with Gas-Filled Lamps.—Duplex Lighting Works of General Electric Co., 6 West 48th street, New York, N. Y.

"Duplexalite." Catalog Nos. D-131, D-231, D-531, D-1031.

Listed May 16, 1919.

Fuses, Cartridge.—Atlantic Electric Goods Co., Inc., 1168 Broadway, New York, N. Y.

Cartridge enclosed fuses, 0-600 amperes, 250 volts.

Listed July 16, 1919.

Heaters, Curling-Iron.—American Electrical Heater Co., Woodward, Burroughs and Cass avenues, Detroit, Mich. Triangle Lektrik Sales Co., Detroit, Mich. (submittor).

"Triangle Lektrik," 100-125 volts, 85 watts, Catalog No. 601.

Listed May 15, 1919.

Heaters—Pressing Irons.—General Electric Co., Schenectady, N. Y.

Tailors' irons, 750-900 watts, 95-250 volts. Type Z-1053, 12-24 lb. sizes inclusive.

Listed Aug. 1, 1919.

Heating Appliances, Cooking and Liquid.—American Electrical Heater Co., Woodward, Burroughs and Cass avenues, Detroit, Mich.

"American Beauty." Electrically heated cooking appliances for voltages up to 250.

Glower stove, 500 watts, Catalog No. 33506.

Grill, 660 watts, Catalog No. 3375.

Hot plate, 8.9 amperes, Catalog No. 1100B.

Listed July 11, 1919.

Heating Appliances, Industrial and Laboratory.—General Electric Co., Schenectady, N. Y.

"G. E." Glue pots, 20-1100 watts, Types I-1, I-2, I-4, I-6, I-15 to I-18 incl.

Soldering irons, 75-275 watts, 95-250 volts, Types I-8 to I-12 incl.

Listed July 11, 1919.

Insulating Materials.—West Virginia Pulp & Paper Co., 200 Fifth avenue, New York, N. Y.

Fiber sheets having following properties: Absorptive to about same extent as ordinary fiber; readily combustible; moderate mechanical strength and readily worked with tools; not noticeably affected by temperature of 125° C.

While insulating material of this general type is not classed as either nonabsorptive or noncombustible and should, therefore, not in general be used as a substitute for materials so classed, this fiber is judged to be suitable for crossbars, washers, bushings and other small parts of electrical fittings where use of fiber has been recognized.

Manufacturers desiring to use this material should submit samples in commercial form for examination and test by Underwriters' Laboratories.

Listed July 12, 1919.

Internal-Combustion Engine Electric Plant.—Alamo Farm Light Co., 703 Tower building, Michigan boulevard and Madison street, Chicago, Ill.

Nonautomatic starting, internal-combustion engine (Standard Portable) for use with gasoline, and direct-connected electric generator, control apparatus and storage battery for small isolated stationary installations. Electric control automatically stops engine when batteries are fully charged. "Silent Alamo." Rating: Generator 1 kw., 32 volts. Gasoline capacity, 1¾ gal.

Listed Aug. 18, 1919.

Lamp Guards.—McGill Manufacturing Co., Valparaiso, Ind.

Portable steel guards with wooden handles with or without sockets. "Dreadnought," "National," "Crescent Reflecting," "Security," "Universal," "Mogul," "Tubular."

Wall lamp guards. Catalog No. 1436-40 incl., 1580-81 incl., 1583, 1585, 6000, 6005. "McGill."

Listed July 25, 1919.

Lamp Guards.—Racine Iron & Wire Works, Racine, Wis.

"Buck." Pendent or portable wire lamp guards. Catalog Nos. 1, 2.

Listed Aug. 21, 1919.

Outlet Bushings.—Adapti Manufacturing Co., 919-25 West street, Cleveland, Ohio.

Connector bushings of malleable iron or pressed steel, for connecting armored cable or flexible steel conduit to conduit boxes, Catalog Nos. 910, 931, 940, 941.

End outlet fittings for rigid conduit made for cast iron having porcelain covers with separate wire holes. Catalog Nos. 8900-02 incl., 8970-72 incl.

Listed Aug. 2, 1919.

Outlet Bushings.—James E. Gleason Co., 515 West Jackson boulevard, Chicago, Ill.

Connector bushings of pressed steel for connecting armored cable or flexible steel conduit to outlets.

Listed Aug. 8, 1919.

Outlet Bushings.—James C. Phelps, Springfield, Mass.

Brass and cast-iron fittings, "J. C. C." Caplets, Type AB.

For use only at an exposed end of conduit (but not under fixture canopies) and only where conduit wires pass out through fitting without splice, joint or tap within fitting.

Listed June 3, 1919.

Outlet Plates.—The B. & D. Electric Co., 183-185 Congress street, Boston, Mass.

Cast-iron outlet plates, Catalog No. 15.

Listed Aug. 5, 1919.

Outlet Plates.—The Pratt Chuck Co., Frankfort, N. Y.

Pressed-steel outlet plate ¾ in. for flexible tubing.

Listed July 19, 1919.

Outlet Plates.—The Toledo Metal Products Co., 956 Spitzer building, Toledo, Ohio.

"B.-G." Steel outlet plates, Catalog Nos. 904-R, 905-R.

Listed Aug. 9, 1919.

Panelboards.—Starrett Manufacturing Co., 523 South Green street, Chicago, Ill.

Consisting of double-pole toggle switch and plug-fuse cutout bases mounted in cutout box with auxiliary cover which encloses all live metal parts except flush receptacles for Edison plug fuses. Capacity not to exceed 30 amperes, 125 volts.

Listed July 31, 1919.

Raceway Fittings, Metal.—Appleton Electric Co., 218-30 North Jefferson street, Chicago, Ill.

Fittings for use with "Pagrip" metal raceways. Catalog Nos. 350, 355, 365, 370, 375, 380.

Listed June 27, 1919.

Receptacles for Attachment Plugs, and Plugs.—The Bryant Electric Co., Bridgeport, Conn.

"Bryant" or "Perkins." 12 amperes, 250 volts. For use in marine wiring when mounted in conduit boxes, receptacles, Catalog Nos. 583, 584; plugs 585-88 incl.

Listed July 2, 1919.

Receptacles for Attachment Plugs, and Plugs.—Central Electric Co., 320 South Wells street, Chicago, Ill.

Receptacles and plug attached to standard enclosed switch and so interlocked with switch mechanism that plug cannot be used to make or break circuit under load. "Ralco No. 42 Safety Receptacle." 60 amperes, 250 volts d. c. or 500 volts a. c., 3-pole.

"Ralco." 25 amperes, 220 volts. Catalog Nos. 1S.T. and 13S.T.

Listed Aug. 5, 1919.

Trade Activities

Ideal Electric Holds Sales Conference — New Roller-Smith Representatives—Electric Traveling Crane Exhibit

E. B. Badger & Sons Co., 63-75 Pitts street, Boston, Mass., announces the opening of a Chicago office, with Harry E. Wheeler as manager. Mr. Wheeler will be pleased to quote prospective customers on their requirements for air washers for turbo-generators, or spray ponds or cooling towers for cooling water for condensing plants.

Eureka Vacuum Cleaner Co., Detroit, Mich., is sending to dealers an attractive poster, 28 by 42 in. in size, an enlargement of the Eureka advertisement appearing in the October issues of *Ladies' Home Journal* and *Good Housekeeping,* and the Oct. 4 issue of the *Saturday Evening Post* and presents forceful arguments in favor of this labor-saving device. Another opportunity is thus afforded dealers of this cleaner to tie in with the extensive national advertising campaign now being conducted by the Eureka company. This campaign is one of the biggest things ever undertaken by the company and dealers can ill afford to pass by the opportunities presented by it to increase their sales for the Eureka vacuum cleaner.

Western Electric Co., 195 Broadway, New York City, has recently opened a new branch, consisting of a sales office and warehouse at 334 East Bay street, Jacksonville, Fla., in charge of A. H. Ashford. This new distributing house has been established for the purpose of enabling the company to give improved service to its customers in the extreme southeastern part of the United States. A complete line of electrical supplies and specialties will be carried at this house, this to include pole-line hardware, cross-arms and other pole-line construction material; all inside wiring material; portable sewing machines, vacuum cleaners, washing machines, heating apparatus and all other electrical household appliances.

Sprague Electric Works of General Electric Co., New York, N. Y., is sending out Bulletin No. 47942, introducing a new line of safety panel boards and cabinets, which are applicable wherever the live front type of panel board has heretofore been used. The branch circuit switches and main switches are distinctive features of these panel boards. They are simple in design, of strong construction, and positive in action, and are designed especially for safety panel board use and are claimed to outlast the type of switch generally used for this service. These panel boards meet the requirements of the National Board of Fire Underwriters. The bulletin contains considerable data on this new equipment and includes numerous illustrations.

Greaves-Etchells Furnace for Brazilian Plant.—Captain Teixeira, a member of the Brazilian Military Commission, who recently spent several months in this country investigating steel plants and electric furnaces particularly, has placed an order through Fenwick Freres & Co., New York City, for a Greaves-Etchells electric furnace, manufactured by the Electric Furnace Construction Co., Finance building, Philadelphia.

Electric Appliance Welcomes Home Soldier Employes.—On the evening of Sept. 26, the officers of the Electric Appliance Co., Chicago, tendered to its men returning from the service a reception and dance at the Masonic Temple. Various committees had charge of the affair, the Floor Committee taking upon itself to see that everyone became acquainted with the soldier employes. Several hundred couples danced into the early hours of Saturday morning, and all who were present pronounced the occasion a big success. The 40 soldier employes of the company who achieved distinction in many ways served in the Infantry, Medical Corps, Cavalry, Artillery, Ordnance, Quartermaster, and one in the Balloon Squadron. One of this number was gassed and another badly wounded, the latter still being in France.

The Bearings Co. of America, Lancaster, Pa., at a recent meeting of its board of directors decided to increase the facilities of the thrust bearing factory. A new building of the latest type of construction is to be erected in the immediate future, which will give approximately 10,000 sq. ft. additional space when the building is completed. This addition to the manufacturing facilities of the thrust bearing section of the company, with the new buildings which were completed last year for the increased production of its Universal joint plant in which is manufactured "Sterling" Universal joints for automobiles, trucks and tractors, is brought about by the material increase in the production of the automobile and allied industries. This will give the company four separate buildings, the first, for the first of complete thrust ball bearings; the second, for the manufacture of "Star" ball retainers of all types; third, for the manufacture of "Sterling" Universal joints, and fourth, for the manufacture of drop forgings. During the recent war, the company supplied large quantities of thrust bearings for use in Liberty airplanes, gun mount bearings for Navy Ordnance, thrust bearings for use in Class B motor truck steering gears, and for many other departments of war work that required ball thrust bearings.

The Roller-Smith Co., 233 Broadway, New York, N. Y., announce the appointment of the Alfred Collyer Co., 420 Power building, Montreal, Canada, as its agent for the entire Dominion of Canada and Newfoundland. The Collyer company will handle the Roller-Smith Co.'s products of instruments and circuit breakers. As the company has had an extensive experience in marketing electrical apparatus, it is particularly well fitted to handle the Roller-Smith Co.'s rather complex lines. The Alfred Collyer Co., which also represents the Wagner Electric Manufacturing Co., has a branch office at 183 George street, Toronto.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., is distributing Bulletin 1537, presenting details of Allis-Chalmers oil engines, Diesel type, and instructions for ordering repairs and spare parts. This publication, comprising 31 pages, is devoted entirely to line drawings and half tone illustrations of Allis-Chalmers oil engines and the various parts entering into their construction. Another bulletin prepared by the company is No. 16320 dealing with centrifugal pumps and centrifugal pumping units. Both the centrifugal pump and driving agent have certain fixed characteristics which cannot readily be altered by adjustment. For this reason both the manufacturer and purchaser of centrifugal pumping units should give careful consideration to these points, and in order that no important point be overlooked, it is recommended that the complete unit be purchased from one manufacturer who designs and builds both the pump and driving member. Some 40 pages of this booklet are devoted to detailed descriptions of centrifugal pumping units which the Allis-Chalmers company builds for practically any pumping requirement. The advantages of this apparatus are clearly set forth, the fundamental points of efficiency, accessibility, durability and ruggedness of construction having received careful consideration in the design of Allis-Chalmers centrifugal pumps. Illustrations of the various types of pumping units, views of typical installations, efficiency charts, etc., are also included. The experience of the Allis-Chalmers company in the design of centrifugal pumping units extends for a period of many years, and its ability to select and furnish a complete unit of its own manufacture is almost unique in this respect of combined responsibility.

Roller-Smith Co., 233 Broadway, New York City, announces the appointment of the General Machinery Co., 744-5 Brown-Marx building, Birmingham, Ala., as its agent in the states of Florida, Georgia, Alabama

and Tennessee. The General Machinery Co. will handle the Roller-Smith Co.'s line of instruments, circuit-breakers and meters in this territory, and as it had an extensive experience in handling apparatus lines, it is particularly well fitted to handle the Roller-Smith Co.'s rather complex lines. The personnel of the General Machinery Co. consists of: B. A. Schroder, president, W. H. Price, sales engineer. The company has been located in Birmingham for about ten years and has a wide acquaintance with the trade. In addition to representing the Roller-Smith Co., it also represents the following manufacturers: Crocker-Wheeler Co., Goodman Manufacturing Co., Cutler-Hammer Manufacturing Co., Pittsburgh Transformer Co., and Esterline Co.

The Ideal Electric & Manufacturing Co., Mansfield, Ohio, held a sales conference at its Mansfield works during the week of Aug. 11. The following is a list of representatives who took part in the conference, S. Glen Vinson, secretary and general manager; L. S. Meeker, sales manager; T. Weiss of the Milwaukee office; C. A. Kuehn of the Cleveland office; James Kent of the Chicago office; R. F. Cooseka of the Minneapolis office and H. J. Brower of the New York office. Due to the business activities at the different agencies the district sales representatives from the following districts were unable to take part in the conference, J. M. Brugler of the Philadelphia office; A. L. Searles of the Grand Rapids office; and David Stead of the Denver office. In addition to the discussion of sales matters, the social side of the conference was a source of much pleasure to the "Ideal" men. Mr. Meeker took the various representatives through the plant explaining the details of the new types of motors under construction. From every point of view the conference afforded much benefit as well as pleasure and the Ideal Electric & Manufacturing Co. is already making plans for a more elaborate sales conference at some date in the future.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has prepared a new four-page two-color 8½x11 folder, the title of which is C-H Drum Controllers. It gives prominence to the outstanding features of C-H drum controllers which have won an enviable position in the drum controller field. Three of the features are: accessibility, interchangeability of parts and interchangeability of methods of manipulation. Any C-H standard stock drum can be equipped with either rope, radial or straight line drive and these are interchangeable. The folder plays up other points, such as, the ease with which the contact fingers and the cylinders may be removed; the absence of wood in construction; the square metal shafts, and the straight non-stubbing fingers. Dimensions, ratings and other engineering data are given. Three types having common dimensions comprise five bulletin numbers, capable of controlling and motors from 1 to 100 hp. The folder had been prepared especially for the St. Louis convention of the Association of Iron and Steel Electrical Engineers, at which it was distributed last week, but it is also being forwarded on request by those interested in drum controllers.

Mercury Manufacturing Co., 4118 South Halsted street, Chicago, is sending out an illustrated circular entitled "Mule-Hide and The Trackless Train." Mercury tractors have been applied to practically every transportation problem and have been productive of wonderful results. A typical installation of the "Trackless Train" is that in the plant of the Lehon Co., manufacturer of Mule-Hide roofing for buildings and cars, and waterproof paper and insulating paper for refrigerator cars. In this circular is contained the testimony of Tom Lehon, vice-president and general manager of the company, bearing evidence of the accomplishments of the Mercury tractor. Mr. Lehon states that since the installation of the tractors, the cost of handling raw and finished products has been reduced 25% and no mechanical trouble has been experienced with the machine. In conclusion he recommends the tractor as an excellent investment no matter how difficult the haulage problem may be and recognizes the true worth of the "Trackless Train."

The Independent Pneumatic Tool Co., Chicago, is reported to be doing a business that compares very favorably with that of last year. When the war closed there was a heavy slump in pneumatic tool orders, as a great part of the output was being taken for use in war material industries. During the war the company's energies were devoted chiefly to the manufacture of pneumatic tools, but since then the electrical tool department of the business has been pushed with such success that its sales are expected to bring the total earnings up to a level with last year's net. Agencies are now being established for the company's electrical tools in Europe and in the orient and South America, and foreign orders are reported to be growing rapidly in volume. At the company's offices it was stated that the electrical tool business of the company is expected to equal that of the pneumatic tools in the not distant future. The company has paid 15% in dividends this year and on Oct. 1 paid more than 5%.

Electric Traveling Crane Exhibited for Foundrymen.—One of the most interesting exhibits held in connection with the annual meeting of the American Foundrymen's Association at Philadelphia, on Monday to Friday of this week, was a full sized 10-ton electric Chesapeake traveling crane in actual operation. An experienced woman crane operator demonstrated the use of this labor-saving machine to the foundrymen and other visitors. This exhibit was made by the Chesapeake Iron Works, Baltimore, Md., and served incidentally to call attention to the war record of this company in this line. Within 1½ years the company built, shipped and put into continuous service over 140 large electric traveling cranes, ranging from 20 to 110 ft. in span, and aggregating nearly 6000 ft. in span. Over 40 of these cranes were shipped to France for use in United States base ordnance plants and over 45 of them did day and night service in some of the largest ordnance plans in this country. Views of some of these war cranes were shown in the exhibit booth. The accompanying illustration shows the 10-ton exhibit crane receiving its dress rehearsal at the Baltimore works just before it was dismantled and shipped to the foundrymen's exposition at Philadelphia. This exhibit was produced at the request of F. S. Chavannes, president of the Chesapeake Iron Works, under the general direction of Frank L. Perry, the company's publicity manager, who will be remembered as the advertising manager of the old WESTERN ELECTRICIAN, which was merged with ELECTRICAL REVIEW in 1908.

A 10-Ton Chesapeake Electric Traveling Crane Being "Tuned Up" at the Works for Exhibition Before the American Foundrym en's Association.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Fall River, Mass.—In connection with the construction of a new crude oil refinery to be located in the north end section of the city, by the New England Refining Co., estimated to cost $300,000, considerable new electrical and mechanical equipment will be required.

Greenfield, Mass.—Stanley Insulating Co. has had plans prepared for the erection of a new addition to its plant, to provide for increased operations. The structure will cost about $30,000.

New Bedford, Mass.—National Spun Silk Co. has awarded a contract to the J. G. White Engineering Corp., 43 Exchange place, New York, for the construction of a new one-story reinforced concrete power plant at its works, to cost about $100,000.

Springfield, Mass.—Westinghouse Electric & Manufacturing Co. is arranging plans for the erection of a large new addition to its plant at East Springfield.

Thorndike, Mass.—Leary & Walker, engineers, New Bedford, will soon award contract for the erection of a six-story, 75x163 ft., factory for the Thorndike Co., to cost about $175,000. A steam heating system and electric power will be installed.

Bridgeport, Conn.—Bryant Electric Co. has completed arrangements for the erection of a four-story addition to its plant on Hancock avenue, about 60x218 ft., to be used for increased capacity. The structure is estimated to cost $120,000.

Hartford, Conn.—Arrow Electric Co. has completed negotiations for the purchase of property adjoining its present plant, extending from Hawthorne street to the New Haven railroad, to be used for future expansion.

Stamford, Conn.—L. C. Terwilliger, Bridgeport, has completed arrangements for the purchase of the business of the Stamford Storage Battery Co., 22 Main street, Stamford. The new owner will continue operation of the business.

Buffalo, N. Y.—E. J. Wiggins Electrical Corp. has filed notice with the secretary of state of a change in its corporate name to the Allan Manufacturing & Welding Corp.

Dunkirk, N. Y.—Common Council is considering plans for the extension of the ornamental street lighting system from Fourth to Main streets.

New York, N. Y.—Display Stage Lighting Co., 314 West Forty-fourth street, has increased its capital from $10,000 to $50,000, for general business expansion. Notice of the increase has been filed with the secretary of state.

New York, N. Y.—Wilson-Maeulen Co., 781 East 142nd street, manufacturer of pyrometers and similar equipment, has awarded a contract to the Austin Co., 217 Broadway, for the construction of its proposed three-story plant to be located at St. Mary's street and Concord avenue, for increased capacity. Charles H. Wilson is president.

New York, N. Y.—Jandous Electric Equipment Co., 109 West Thirty-first street, has been awarded a contract for the electrical work in connection with the new public school building to be erected at Forest Hills, Long Island. The contract price was $13,456.

New York, N. Y.—Considerable new electrical and mechanical equipment will be required by the Aluminum Co. of America, 120 Broadway, in connection with the construction of its proposed three-story plant addition, about 125 by 300 ft., at Edgewater, N. J., contract for which was recently awarded to the Turner Construction Co., 244 Madison avenue.

Port Chester, N. Y.—P. R. Mallory, manufacturer of tungsten products, is having plans prepared for the construction of a new two-story and basement plant to provide for increased operations. The structure will be of reinforced concrete construction, about 40 by 112 ft., and is estimated to cost $60,000. Lockwood Greene & Co., 101 Park avenue, New York, are engineers.

Rochester, N. Y.—Plans have been filed by the Wheeler Green Electric Co., 29-33 St. Paul street, manufacturer of electric motors, etc., for the construction of a new addition to its plant, for increased capacity. The structure will be about 40 by 40 ft., and is estimated to cost $19,000.

Thorold, N. Y.—Plans are being arranged for the installation of a new street-lighting system throughout the municipality.

Elizabeth, N. J.—Considerable electrical and mechanical equipment will be required by the Warner Quinlan Asphalt Co., in connection with the construction of the proposed one-story filter plant, about 66 by 72 ft., to be located at Warner, N. J., estimated to cost $55,000.

Glassboro, N. J.—In connection with the construction of the proposed local normal school building by the State Board of Education, to be located in the vicinity of the railroad station, plans have been arranged for the erection of a power plant for general operation. The project is estimated to cost about $350,000. Calvin N. Kendall, State House, Trenton, is secretary of the board.

Hilton, N. J.—Following the acquisition of a tract of about four acres of land on Burnett avenue, Hilton, by H. Boker & Co., Inc., 101 Duane street, New York, manufacturer of steel and metal products, plans are being prepared for the construction of an initial group of buildings to form the first unit of a proposed plant by the company. Considerable electrical and mechanical equipment will also be required in connection with the new plant. Gilbert C. Higby, 207 Market street, Newark, N. J., is architect for the company.

Newark, N. J.—American Platinum Co., 231 New Jersey Railroad avenue, has had plans prepared for the construction of a new one-story brick boiler plant, about 25 by 42 ft.

Newark, N. J.—Public Service Electric Co. has filed plans for the erection of a new five-story brick and steel building and coal bunkers at its Point-No-Point electric station, about 48 by 92 ft., to facilitate operations. Estimated cost, $175,000.

Newark, N. J.—Eagle Electric Co. has filed notice of organization to operate at 158 Belmont avenue. Louis Maltz, 138 Prince street, and Morris Eklowstein, 230 West Kinney street, head the company.

Newark, N. J.—In connection with the establishment of the new plant of the Stanwood Rubber Co., located near the Newark-Elizabeth line, plans are being prepared for the erection of a new power plant, with capacity of about 1500 hp., to cost approximately $140,000. The site was formerly the property of the Diehl Manufacturing Co. and comprises a three-story reinforced concrete building with about 68,000 sq. ft. of manufacturing space. It is understood that the present power plant, a smaller structure, will be used for auxiliary operations at the works, while plans are also being prepared for a number of additions to the plant on adjoining property. It is proposed to have an initial output of about 500 cord tires a day, to be increased ultimately to 1000 tires and 2000 tubes per day. C. E. Barker is president.

Wilmington, Del.—Diamond Ice & Coal Co. is planning for the erection of a large addition to its plant, 11th street and Grant avenue, about 83 by 83 ft., estimated to cost about $50,000, and considerable electrical equipment will be required.

Bangor, Pa.—Plans are under consideration by the Bangor Central Quarry, operated by C. C. Wise and Peter Yetter, for immediate repairs

distributed last week, but it is also

Exhibition Before the American Foundrymen's Association.

in the boiler plant at the works, recently damaged by fire.

Carlisle, Pa.—C. H. Masland & Sons, Amber and Westmoreland streets, Philadelphia, Pa., have awarded a contract to the J. S. Rogers Co., Drexel building, Philadelphia, for the construction of a two-story power plant extension at its works on Carlisle Spring road, Carlisle. The structure with equipment is estimated to cost $150,000.

Catasauqua, Pa.—Town council has entered into a contract with the Lehigh Valley Light & Power Co., whereby the latter will furnish electric energy for street-lighting service to the municipality for a period of about ten years.

DuBois, Pa.—Northwest Mining & Exchange Co. is considering plans for the construction of an addition to its power plant. Seth H. Bloom is general manager.

Philadelphia, Pa.—Notaseme Hosiery Co., Mascher street, Germantown, will construct a power plant for works service in connection with its mill to be erected at Atlantic and I streets.

Philadelphia, Pa.—City has awarded a contract to the Dravo-Doyle Co., Commercial Trust building, for the installation of the proposed centrifugal pumping units at the Queen Lane pumping station. It is proposed to install four new units having a pumping capacity of 40,000,000 gal. every 24 hours. Estimated cost $404,600.

Philadelphia, Pa.—Penn Silk Hosiery Dye Works will build a new boiler plant and stack at its works.

Philadelphia, Pa.—In connection with the construction of a new five-story brick plant, about 80 by 250 ft., for the American Preserve Co., Third and Lehigh avenues, plans have been prepared for the erection of a new one-story brick boiler house, about 50 by 70 ft., to be used for general factory operation. Peuckert & Wunder, 310 Chestnut street, are architects for the company.

Pittsburgh, Pa.—Lutz & Schramm Co. has had plans prepared for the erection of a one-story boiler plant at 1412 River avenue.

Reading, Pa.—Metropolitan Edison Co. has been awarded a contract by the Textile Machine Co. for furnishing electric service for the complete operation of its plant.

Providence, R. I.—Electrical Products Manufacturing Co. has filed notice of organization to operate at 69 Sprague street for the manufacture of electrical goods. The company is an affiliated organization of the Commercial Radio Co. of America, Providence. H. A. McAvoy is secretary.

Baltimore, Md.—Maryland Color Printing Co. will install 600 hp. in motors.

Crownsville, Md.—Crownsville State Hospital has awarded a contract to the John Waters Building Co., 23 East Center street, for alterations and improvements in the power plant and heating system at the institution.

Monkton, Md.—In connection with the new plant of the Monkton Roller Mills, recently organized with a capital of $1,000,000, to comprise main manufacturing building, eight-story and basement, about 44 by 116 ft., with auxiliary structures, considerable electrical and mechanical equipment will be required. It is proposed to have a daily capacity of 2000 bbl. flour and 128,000 lb. mixed feed. Electric energy for operation will be furnished by the Consolidated Gas, Electric Light & Power Co., Baltimore. Otis E. McCoy is president, and Thomas B. Wolfe general manager.

DATES AHEAD.

National Association of Electrical Inspectors. Annual meeting, Springfield, Mass., Oct. 13 and 14. Secretary, W. L. Smith, Concord, Mass.

Illuminating Engineering Society. Annual convention, Chicago, Ill., Oct. 20-23. General secretary, Clarence L. Law, 29 West 39th street, New York City.

Illinois State Electric Association. Annual convention, Chicago, Oct. 22 and 23. Secretary-treasurer, R. V. Prather, Springfield, Ill.

Empire State Gas and Electric Association. Annual meeting, Buffalo, N. Y., Oct. 24. Secretary, Charles H. B. Chapin, 29 West 39th street, New York City.

American Society of Mechanical Engineers. Annual meeting, New York City, Dec. 2-5. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

National Council of Lighting Fixture Manufacturers. Annual convention, Detroit, February, 1920. Secretary-treasurer, Charles H. Hofrichter, Cleveland, Ohio.

Norfolk, Va.—Norfolk Electric Manufacturing Co. plans to build a plant for the manufacture of induction motors of from 1 to 5 hp. Prices are desired on machine tools, ovens, bolts, etc. P. O. Sutton, 215 Cumberland street, is general manager.

Laurens, S. C.—Plans are under consideration by the city council for the issuance of bonds for $200,000, to cover the cost of extensions in the electric lighting and water systems, as well as other municipal work.

Plains, Ga.—Oct. 14 an election will be held to vote on the question of issuing $6500 in bonds to install an electric plant in connection with water plant. Address mayor.

NORTH CENTRAL STATES.

Akron, Ohio—Miller Rubber Co. is increasing its capital $800,000 to provide for factory expansion. This will bring its capital up to $9,832,700.

Genoa, Ohio—Nov. 4 the question of issuing $5,000 municipal light bonds will be submitted to vote. Address village clerk.

Mansfield, Ohio — Westinghouse Electric Products Co. will enlarge its plant by the erection of a six-story addition which will provide about 80.000 sq. ft. of floor space. The extension will be used for the manufacture of heating appliances, electric irons and similar products.

New Madison, Ohio—Madison Lighting Co. has increased capital from $3500 to $10,000.

Norwood, Ohio—Insurance adjusters inspected the ruins of the Norwood municipal electric light plant and water works and then requested the city officials to repair as far as possible the damage caused by fire. Address Harry J. Pierson, service director.

Oberlin, Ohio—A bond issue of $50,000 has been authorized for the construction of a municipal electric light plant.

Greencastle, Ind.—Standard Heating Sales Co. has changed its principal office from Terre Haute, Ind., to Greencastle, Ind.

Hammond, Ind.—American Steel Foundry Co. has purchased a tract of land in the Indiana Harbor factory district involving nearly $1,000,000. The tract comprises 100 acres, just south of the harbor ship canal and has a canal frontage of one-half mile. A program of expansion is being mapped out to begin as soon as the strike is over. This purchase quadruples the land holdings of the American Steel Foundry Co. and makes it one of the heaviest land owners in the Calumet factory district.

Indianapolis, Ind.—Haywood Tire & Equipment Co. will build a foundry to cost $75,000.

Indianapolis, Ind.—Cole Motor Car Co. will add two new buildings to its plant at Washington and Davidson streets. The expansion will involve an expenditure of $1,000,000. First building to be completed by Jan. 1, will be five stories, steel and brick construction, 180 by 228 ft. The second building, to be completed March 1, 1920, will be a duplicate of the first and will be 132 by 212 ft.

LaPorte, Ind.—Wanatah Electric Co. has changed its name to the Wanatah-LaCrosse Electric Co.

Muncie, Ind.—City council has authorized the erection of a new city building to cost $250,000.

Chicago, Ill.—American Car & Foundry Co. will build addition to its present plant on South Paulina street, south of Blue Island avenue, to cost, together with the rebuilding of the old plant, about $2,000,000. The present plant will eventually be torn down and a new one similar to the proposed addition will be built. The plant will have a capacity of 50 steel freight cars per day. It now turns out 30 daily. It will be one of the largest of the 16 freight car plants of the company.

Chicago, Ill.—Architect Z. E. Smith, 305 East 55th street, Chicago, has prepared plans and will let contracts for $200,000 shop and power house to be erected. Specifications include power station equipment, electrical equipment, boilers for steam heating.

Delavan, Ill.—Delavan, Green Valley and San Jose will be supplied with day and night current for light and power by the plant which is being rebuilt by F. B. Hullinger of San Jose, Ill. Mr. Hullinger has completed an addition, 40 by 60 ft., to his building and is installing two new boilers, 150 and 95 hp. respectively, and two new generators of 150 and 90 kv-a. respectively. A transmission line, 12 miles in length, will be built to connect Delavan and Green Valley with San Jose. The plant at Delavan will be closed. Green Valley has not

been served with electric light and power before.

Elgin, Ill.—A bond issue of $200,000 is planned for a municipal lighting and electric power plant.

Elgin, Ill.—Elgin Sanitary Milk Co. will erect a $25,000 milk bottling plant. Address Oscar Ludwig, president.

Galesburg, Ill.—Farmers and Mechanics Bank will erect new bank and office building to cost $150,000.

Rankin, Ill.—Architects McCoy and Skaddin, Dale building, Rankin, have prepared plans for $30,000 water works and power house to be erected by city. The building will be one story in height, 30 by 86 ft. in dimensions. Address superintendent of water department.

Urbana, Ill.—University of Illinois will build new addition to power house to accommodate two 500-hp. boilers which are being added to the equipment.

Detroit, Mich.—Detroit Edison Co. will erect an $80,000 addition to its power plant. The specifications include generators, transformers, etc. Address Alex Dow, president, Whitman building, Detroit, Mich.

Detroit, Mich.—General Ice Delivery Co. is having plans prepared for the construction of a one-story 36 by 322 ft. ice storage plant on Warren avenue. An electric motor for power and an ice handling conveyor will be installed. Dalton R. Wells, 435 Woodward avenue, architect.

Escanaba, Mich.—If plans now under way materialize Escanaba is to have a great "white way." The plans now being worked out contemplate the erection of a large number of cluster lights on both sides of Ludington street from Oak street down to the post office block. Address Jacob Kratze.

Kalamazoo, Mich.—The city will hold an election Nov. 4 to vote on the issuance of $1,250,000 electric light bonds.

Reed City, Mich.—Osceola Light & Power Co. plans the installation of an auxiliary plant. It is reported that the company has placed orders for engines and boilers for the plant.

Ashland, Wis.—Northern National Bank will erect new bank building to cost, exclusively of interior work, $47,500.

Osseo, Wis.—The city council has under consideration the purchase of the local electric light plant and also the installation of a waterworks system.

Portage, Wis.—Contracts have been awarded for the Portage Madison, Janesville Interurban Railroad. After practically a standstill in construction for several years a contract has been awarded for completion of the line according to J. E. Jones, Portage, head of system.

Waupaca, Wis.—Waupaca county will receive bids for a hydroelectric power plant. Address E. H. Josslyn, Algoma block, Oshkosh, Wis.

Beverley, Kans.—Ordinance has passed granting a franchise to John S. Painter to furnish electricity to the city for a period of fifteen years. Waldo Hancock, city clerk.

Coldwater, Kans.—Election to vote $35,000 in bonds for the purchase of a new engine and to make other improvements to the water and power plant, carried.

Elk City, Kans.—C. R. Long, Elk City, has been granted a franchise to install a light plant that will give the city 24-hour service, starting with 50 street lights.

Garden Plain, Kans.—N. B. Rollins & Co., 209 Railroad Exchange building, Kansas City, Mo., engineers, have prepared plans for electric light plant to be erected by city. E. Behm, city clerk.

Hudson, Kans.—Engineers N. B. Rollins & Co., 209 Railway Exchange building, Kansas City, Mo., engineers, have prepared plans for a $15,000 electric transmission line to be built from Hudson to Stafford, Kans. Address Esther Arnold, city clerk, Hudson, Kans.

Junction City, Kans.—Riverside Power & Light Co. is making plans to extend its lines to White City and will form a circle of towns around this city. The company now furnishes power to more than forty towns in Kansas.

Richmond, Kans.—Plans are in progress for the construction of a transmission line from Ottawa, wiring the city of Richmond, purchasing meters, transformers, street lights and all other necessary equipment.

Seneca, Kans.—A new "white way" will be installed in the near future, which will extend four blocks.

Willis, Kans.—Engineers N. V. Rollins & Co., 209 Railway Exchange building, Kansas City, Mo., has prepared plans for a $9000 electric transmission line f rom Willis to Horton, Kans. Address E. Piner, city clerk, Willis, Kans.

Aurora, Mo.—Aurora contemplates purchasing one 15-hp. engine and 9-kw. dynamo for light plant.

Independence, Mo.—Election to vote $65,000 in bonds for the additions and extensions of municipal light and power plant, carried.

Marshall, Mo.—$46,000 in bonds have been voted for erection of electric light plant. Address mayor.

Richmond, Mo.—Plans are in progress for the installation of a "white way." Subscriptions are being solicited from business men.

Beatrice, Neb.—A new hotel to cost $500,000 will be erected by business men of the city.

Holmesville, Neb.—Plans are being prepared for erection of transmission line from Holmesville plant to supply current from lighting towns of Rockford, Filley, and Virginia. Address G. L. Humford, county auditor.

Kimball, Neb.—Election to vote $20,000 for electrical equipment carried.

Lexington, Neb.—The entire milling plant of the Platte Valley Milling Co. at Gothenburg, near here, burned, the loss being placed at $200,000, partly insured. The power plant, mill, elevator and office were destroyed.

Omaha, Neb.—City council has passed ordinance providing for the submission of $100,000 city jail bonds at the time of the regular election Nov. 4.

Plainview, Neb.—An election for a $24,000 bond issue for the installation of an electric light plant, carried.

Fargo, N. D.—$175,000 in bonds have been voted for erection of municipal light plant. John E. Hogan, commissioner.

Great Bend, N. D.—Business men and farmers have incorporated to build an electric light plant. The transmission line will extend from Hankinson to Wild Rice river. Work will be commenced soon. Address Joseph A. Renke, director.

Halton, N. D.—Bonds to the amount of $10,500 have been voted by the city for improvement to the electric light plant.

Madison, S. D.—The city commissioners have awarded to a Minneapolis concern the contract for erecting a power house, to replace that destroyed by fire some months ago.

SOUTH CENTRAL STATES.

Paducah, Ky.—An election will be held in November to vote on the question of issuing $100,000 municipal light bonds.

Clarksdale, Miss.—Johnson-Harlow Lumber Co. will improve its plant and install electric conveying equipment.

Jackson, Miss.—Jackson Light & Traction Co. will improve its electric generating plant. Address L. O. Gordon, manager.

Texarkana, Ark.—Southwestern Gas & Electric Co. is arranging plans for doubling the present capacity of its power plant. It is said that new generating equipment will be installed, the work being estimated to cost $75,000. W. L. Wood is general manager.

Wynn, Ark.—Plans are under consideration by the city for the construction of a new electric light plant, to be used for municipal service. The structure is estimated to cost $90,000.

Ponca City, Okla.—The city council has approved the proposed bond issue for $50,000 to cover the cost of extensions in the municipal electric light plant. W. H. McFadden is mayor.

Shattuck, Okla.—Plans are in progress for waterworks and electrical improvements to cost $75,000. Burns & McDonnell, Kansas City, Mo., engineers. O. W. Nichelson, city clerk. Bonds have been approved and will be sold in the near future.

Abilene, Tex.—American Public Service Corp. will erect plant here. The plans and specifications call for an expenditure of over half a million dollars and it will be one of the finest and best equipped electric ice and power plants in Texas. There will be large cold storage rooms in connection with the plant. High-power lines will be built from Abilene to Anson and other towns in this part

of the state. The building will be fireproof throughout and the machinery all new and of the very latest design. A. Hardgrove, general manager.

Dalhart, Tex.—A modern lighting system is to be installed with the wiring under ground. Work will begin soon.

Marshall, Tex.—The installation of a "white way" is being considered.

Menard, Tex.—Menard Light & Power Co. is considering plans for improvements and alterations in its plant to facilitate operations. It is understood that new generating equipment will also be installed, the entire work being estimated to cost about $40,000.

WESTERN STATES.

Fort Sumner, N. M.—It is planned to install a large hydroelectric plant when the new dam is built, both for light and power purposes. The plant is estimated to cost between $35,000 and $40,000.

Nampa, Ida.—The Nampa Chamber of Commerce is considering the installation of a boulevard lighting system to replace the lights now in use.

Missoula, Mont.—The remodeling of the Missoula Light & Water Co.'s power dam in the Missoula river near Milltown, will cost about $85,000, according to H. L. Bickenbach, superintendent of the street railway here, who will have charge of the work.

St. George, Utah—Certificate of convenience and necessity was granted to the Dixie Power & Light Co. by the state public utilities commission authorizing the erection of a generating electric plant about 21 miles from St. George on the Santa Clara river. The company furnishes St. George and the surrounding territory with electricity and power now but desires to enlarge its plant in order to increase its capacity. Address T. L. Parker.

Seattle, Wash.—The city council has passed an ordinance appropriating $420,000 for expenditure in initiatory work on the city's Skaget river hydroelectric plant, 100 miles northeast of the city. The first work will consist of building a road, already located and surveyed, and the installation of a sawmill and power plant for construction purposes. The purpose is to engage a construction engineer to supervise the work of carrying out the plans to be furnished by the city engineer. It is proposed to pay the construction engineer an annual salary of $10,000 to $15,000.

Spokane, Wash.—F. E. Martin will erect a power house at the Edgecliff sanitarium at a cost of $21,110, contract having been awarded by the county commissioners.

Astoria, Ore.—Negotiations have been completed by the Pacific Power & Light Co. for the purchase of property located on Young's Bay, Astoria, comprising a total of about 15 acres, to be used as a site for the construction of a large new power, light and gas plant. In connection with the new plant, a distributing system will be constructed to furnish electric energy, etc., in the lower Columbia river district. The works are estimated to cost $75,000.

Bend, Ore.—The construction of a 1000-kw. steam plant is contemplated by the Bend Water, Light & Power Co. The new plant will double the present power outfit. Estimated cost, $100,000. J. H. Foley, Bend, manager.

Florence, Ore.—The Florence Electric plant owned by G. G. Bushman of Eugene was burned, causing a loss of $10,000. It will be rebuilt.

Grants Pass, Ore.—Plans are being arranged by the California-Oregon Power Co. for the construction of a new electric transmission line to extend from Medford to Roseburg.

Portland, Ore.—Northwestern Electric Co. has had plans prepared for extensions in its steam and electric mains, and active work has been inaugurated recently. The improvements are estimated to cost $100,000. G. C. Pierce is vice-president and general manager.

Chico, Cal.—Board of Trustees is understood to be arranging plans for the erection of a new local power plant and distributing system, to be used for municipal service.

Copperopolis, Cal.—Calaveras Copper Co. is understood to have completed plans for the erection of a new power plant and reservoir at its local plant, to be used for the furnishing of electric energy for general works operation.

Los Angeles, Cal.—Announcement has been made that plans are being prepared by the Goodyear Tire & Rubber Co., Akron, Ohio, for the erection of a large new plant on property recently acquired. The new factory will include a number of structures for various departments of operation, as well as the erection of an electric power station. Considerable electrical and mechanical equipment will be required in connection with the proposed project, which is estimated to cost in excess of $3,000,000.

Los Angeles, Cal.—In connection with the new packing plant to be constructed at Vernon by the California Provision Co., large quantities of electrical and mechanical equipment will be required. The works will comprise a number of structures, including boiler plant and refrigerating department. Estimated cost, $200,000.

Pasadena, Cal.—Warnerlite Co., Davenport, Iowa, manufacturer of electrical products for automobile service and kindred specialties, is planning for the construction of a large new local plant. The works will be erected on the unit system and it is understood that the initial structure is estimated to cost about $100,000.

Petaluma, Cal.—Petaluma - Santa Rosa electric railroad is planning to increase its present operations. Plans are being prepared for the extension of its electric system from Forrestville to extend to the Russian river at the Walls-Ford bridge.

Richmond, Cal.—Pacific Oil & Lead Co. has completed arrangements for the installation of 40-hp. additional in motors at its plant, to provide for increased operations. Electric energy will be furnished by the Western States Gas & Electric Co.

Richmond, Cal.—Plans are under consideration by the city council for the installation of a number of new electroliers for extensions in the street lighting system in the downtown district. It is understood that about 117 units will be installed.

Richvale, Cal.—Board of Supervisors has granted a franchise to J. W. Northedge providing for the operation of an electric light plant for the furnishing of electric service to Richvale. Power will be purchased from the Pacific Gas & Electric Co.

Whittier, Cal.—Southern California Edison Co. will build a new brick structure at Greenleaf and Penn streets, to facilitate operations. The building will be about 100 by 100 ft., and is estimated to cost $20,000.

PROPOSALS

Electric Light and Power Plant.—Bids are desired for the erection of a complete electric light, ice and power plant for the city of Wharton, Tex. Address C. M. Hughes, alderman ward No. 1, Wharton, Tex.

Power Plant Equipment.—Bids will be received at Youngstown, Ohio, until Oct. 13 for additions and alterations to electrical equipment of power plant in Mahoning county court house. Crippen & Funk, Ohio Hotel, engineers.

Lighting Fixtures.—Bids will be received Oct. 10 by the Board of Education of Independent School District, Virginia, Minn., for lighting fixtures for the vocational high school building, according to plans prepared by A. W. Kerr & Co., architects and engineers. Address C. R. Johnson, clerk.

Centrifugal Pumps.—Bids are desired by Clinton, S. C., for drilling one or two wells 10-in, or 12-in. in diameter at start, 8-in. or 10-in. finish, 500 to 700 ft. deep, and a centrifugal pump 750 to 1000-gal. capacity, to work against 550 lb. B. B. Mills, superintendent.

Hydroelectric Plant Equipment.—Until 10 a. m., Oct. 17, bids will be received by the Board of Public Works, Seattle, Wash., for furnishing hydroelectric machinery involved in the installation of an additional unit to the Cedar Falls hydroelectric station. C. B. Bagley, Room 234 County-City building, secretary.

Motor-Driven Pump.—Bids will be received by the board of trustees of the State Institute for Feeble-Minded of Western Pennsylvania at Polk, Pa., until Oct. 8 for furnishing a motor-driven low-service centrifugal pump and liquid chlorine machine with platform scales. Specifications may be obtained from Chester & Fleming, engineers, Union Bank building, Pittsburgh, upon deposit of $10. Marvin F. Scaife is secretary of the institution.

Personals

R. J. Gaskill Elected President International Municipal Electricians — J. J. Carrick Joins Paul W. Koch & Co.

CHARLES E. MERRILL, for the past ten years general purchasing agent for the Manhattan Electrical Supply Co., New York City, is now general manager of the Parr Electric Co., wholesale and export electrical supplies, New York City.

WILLIAM BURLEIGH has become chief engineer of the Machinery Sales & Electric Co., Detroit, in charge of designing, estimating and engineering of elevating and conveying equipment. For the past three years Mr. Burleigh has been connected with the Packard Motor Car Co., Detroit, in the capacity of assistant engineer.

JOHN J. CARRICK, who recently received his release from the Navy, has become identified with Paul W. Koch & Co., Chicago, in the capacity of sales engineer. After Mr. Carrick received his technical education he served three years in the electrical department of the Lincoln Park Board, Chicago, which period he spent in the construction of the power plant and underground cable system for park and boulevard lighting. Resigning this position he became connected with the Cutter Electrical & Manufacturing Co., Philadelphia, and for five years served as sales engineer in its Chicago office. At the outbreak of war Mr. Carrick entered the United States Navy with the Illinois Naval Militia, where he served for over two years, spending one year as electrical officer while with the Atlantic Fleet on the *U. S. S. Vermont.* He received the commission of lieutenant senior grade and was recently placed on the inactive list of the Navy.

F. M. WILKES has been appointed commercial agent and new business manager for the Arkansas Light & Power Co., Pine Bluff, Ark., succeeding W. F. Moody. Following his graduation from the Kentucky State University in 1908, Mr. Wilkes served in the power apparatus shops of the Western Electric Co., Hawthorne, Ill. After a year's service he became connected with the Public Service Co. of Northern Illinois as district superintendent in charge of inside and outside construction, continuing in this capacity for three years, when he was appointed consulting engineer associated with Henry C. Wood, Chicago, in 1913, in charge of power contract department, covering the operation of coal mines and the pumping plants in southern Kentucky. He later entered the service of the Missouri Public Utilities Co. as commercial manager with headquarters at Poplar Bluff, having charge of territory comprising the rice farming districts near Dudley and Fisk, Stoddard and Butler counties, Missouri, directing the electrically driven pumping stations for irrigation purposes. During the period of the war Mr. Wilkes served as a captain in the Signal Corps.

ROBERT J. GASKILL, who was elected president of the International Association of Municipal Electricians at its Chicago convention last week, is chief electrician of the city of Fort Wayne, Ind. Though a native of Pennsylvania, born in 1885, Mr. Gaskill was raised and received his early education in Indiana. His first electrical work was with the Bell Telephone Co. and the Western Union Telegraph Co., being employed in line construction work in northern Indiana and Ohio. In 1906 he entered the electrical department of the city of Fort Wayne, becoming chief

R. J. Gaskill.

electrician in the department of public safety the following year, which position he held until 1917, when he enlisted in the army and entered an officers' training camp. He was commissioned a lieutenant in the Artillery and later transferred to the Signal Corps and assigned to the 310th Field Signal Battalion, which went overseas in July, 1918, and served in the Toul sector in France and after the armistice with the Army of Occupation in Germany. He was discharged from the army in July, 1919, and returned to his former position with the city of Fort Wayne. Mr. Gaskill has always been greatly interested in the International Association of Municipal Electricians. He was vice-president for two years, a member of the executive committee for one year and was elected president at the Baltimore convention in 1916. His enlistment in 1917 prevented him from completing his term as president and as a tribute to his patriotism and ability the members again elected him president of the association.

H. C. HANCOCK, who has for several years represented the Trumbull Electric Manufacturing Co., Chicago branch, in the mid-western states, has severed his connection to accept the position of industrial engineer with the Great Lakes Electrical Co., Detroit, Mich., which is said to be the largest electrical supply jobber in the state of Michigan.

CLIFTON R. HAYES, who was elected president of the New England section of the National Electric Light Association at its annual convention last week, is manager of the Fitchburg Gas & Electric Light Co., Fitchburg, Mass., and is one of the best known central-station managers in the Northeast. He was born in Fitchburg, Mass., forty years ago and was graduated in electrical engineering from the Worcester Polytechnic Institute in 1901, and in 1909 received the degree of E. E. from that institution. Mr. Hayes has had a varied experience, including electrical engineering in both industrial and public utility organizations previous to becoming manager of the Fitchburg Gas & Electric Co. about eleven years ago. He was for two years assistant to the superintendent of motive power, Worcester Consolidated Street railway, and for five years electrical engineer for the Ludlow Manufacturing Associates. He is a past-president of the Fitchburg Y. M. C. A. and the Fitchburg Rotary Club, and last year was president of the Tenney Service Association, an organization of managers of public utilities, managed by Charles H. Tenney & Co., Boston.

Obituary.

C. H. HILL, chief electrical inspector of the Philadelphia Fire Underwriters' Association, middle department, and for many years associated with Washington Devereux on the staff of that organization, passed away on Sept. 23, and was buried from his late home in Palmyra, N. J., on Sept. 26.

CHARLES E. LORD, general patent attorney of the International Harvester Co., Chicago, died Sept. 25 from injuries sustained at the company's Deering harvester works when the automobile in which he was going through the plant was struck by a switch engine. Mr. Lord had been the head of the harvester patent department since 1912. He had previously been an examiner in the patent office at Washington, and later was in the service of the General Electric Co., Schenectady, N. Y., and still later with the Bullock Electric Co., Norwood, Ohio, and Allis-Chalmers Manufacturing Co., Milwaukee, Wis. He was a member of the American Society of Mechanical Engineers, Society of Automotive Engineers, Patent Lawyers' Association of Chicago, American Bar Association, American Institute of Electrical Engineers, and other organizations.

Financial News

Valuation at War-Time Prices Opposed.

A joint petition of the Southern Illinois Light & Power Co. and the Centralia Gas & Electric Co. for authority to purchase and sell electric and gas property of the Centralia company has been dismissed by the Illinois Public Utilities Commission. On the question of war-time prices, the decision says: "The commission cannot subscribe to a valuation which is based upon war-time prices in a case where substantially no investment has been made under war-time conditions. To do so would result in burdening a public already carrying a heavy load of war-time prices with increased costs of service received from plant and equipment which has experienced no added usefulness because of the war-time situation. Such a burden so placed could benefit only the interests selling the property, to the permanent disadvantage of the public which receives the service and the utility which would assume the responsibility of operating it upon a financially sound basis. We do not wish to be understood as condemning investment wisely and prudently made in the necessary development of utility property during war times. In many cases extensions and betterments have been made in the interests of the public good under these unusual and trying conditions. Capital so invested is entitled to consideration, but such does not appear to be the case to any marked extent in the present case."

Standard Gas Pays Dividend Debt.

All the back dividends on Standard Gas & Electric Co. preferred stock, amounting to 13%, were ordered paid by the directors in common stock at par, and stock has been mailed to the preferred stockholders. A statement by President H. M. Byllesby accompanying the dividend announcement says that "in the first six months of 1919, without regard to any earnings accruing from its interest in the Shaffer Oil & Refining Co., your company has earned at the rate of over 7% per annum upon its common stock.

"In view of the now rapidly growing position of your company, it was deemed best to pay the accumulated dividends in this manner, rather than to deplete the company's cash resources at a time when it has large and increasingly profitable employment of its funds," the statement adds.

"From the earnings and general condition of your company and the rapidly expanding growth of its newly acquired oil and other interests there appears no reason why the earnings available for the common stock should not rapidly increase and place the value of the common stock of Standard Gas & Electric Co. substantially in excess of par."

Bell Telephone to Sell Notes.

To finance the continued growth of the Bell system, the American Telephone & Telegraph Co., it was announced recently, has arranged to sell $50,000,000 three-year 6% notes. It is expected that a public offering of the notes will be made shortly by a syndicate of bankers. An official of the company was quoted in New York as stating that action already taken by state commissions or consideration already given the present rate schedules of the company and its subsidiaries give assurance that nothing will be done by the rate regulation bodies to jeopardize the company's earnings, which are now, and for the last 13 years have been, sufficient for the payment of all charges and a dividend of 8% on the company's capital stock. The note issue has been underwritten by a syndicate headed by J. P. Morgan & Co.

The Allis-Chalmers Manufacturing Co., it is reported, for the nine months ending with September will have earned for the stock around $2,800,000 after all expenses and taxes. It is figured at this rate earnings on the common for the entire year would be about $8.50 a share after 10% on the preferred.

$4,989,000 Detroit Edison Bonds Offered.

The Harris Trust and Savings Bank (Chicago), Coffin & Burr, Spencer Trask & Co., First and Old Detroit National Bank, Detroit, and the Security Trust Co., Detroit, are offering $4,989,000 Detroit Edison Co. first and refunding mortgage 5% bonds. The bonds are due July 1, 1940, and are being offered at 89 and interest.

The company does the entire commercial electric lighting and industrial power business in Detroit and vicinity, serving a population estimated at over 1,000,000.

During the past seven years gross earnings have more than trebled, while net earnings are almost exactly two and three-quarters times the interest charges on all the mortgage bonds, including this issue. As officially reported for the year ended Aug. 31, 1919, gross earnings were $15,357,202 and net earnings $4,203,261.

Kentucky Utilities Bond Issue.

An offering of $3,500,000 first mortgage lien 6% gold bonds, series "A" of the Kentucky Utilities Co. is being made by Halsey, Stuart & Co., Chicago. The bonds are offered in denominations of $1000, $500 and $100 at 95.84 and interest, yielding 7%, and become due Sept. 29, 1924. They will be a direct obligation of the company and will be secured by a first mortgage upon all of the company's fixed property, rights and franchises now owned or which may hereafter be acquired with the proceeds of these bonds, and by a first lien upon the properties of the Electric Transmission Co. of Virginia through the pledge under the mortgage of all the first mortgage bonds and capital stock of that company now or hereafter outstanding.

The Kentucky Utilities Co., organized in 1912, owns and operates public utility properties. Not later than Oct. 1 the company will absorb the Tennessee Public Service Co., and will acquire all of the first mortgage bonds and capital stock (except qualifying directors' shares) of the Electric Transmission Co. of Virginia. These three companies have been operated practically as a unit for four years and are now serving, primarily with electric light and power, 38 communities with one or more public utility service, viz.: 38 with electric light and power, 8 with ice, 6 with water, 1 with gas, and 2 with street railway service. The company also owns all of the capital stock of the Kentucky Light & Power Co., which supplies light and power to five communities in western Kentucky.

Net earnings of the combined properties for the year ending Aug. 31, 1919, amounted to $448,862.07, or over twice the annual interest charges of $210,000 on all first mortgage lien bonds outstanding.

Progress Slight in Foreign Credit.

Bankers interested in plans for extending financial assistance to Europe, state that while the general situation is unchanged, some progress has been made in enlightening exporters, manufacturers and others on the necessity of their cooperation in extending credits to those countries in dire need.

Concerns who at first displayed little interest or enthusiasm in the bankers' plan now seem to be realizing the importance of bringing the suggestions to a head so that the matter of assisting Europe may be expedited.

War Finance Loans Repaid.

Advances of $220,885,523 have been repaid to the War Finance Corporation, according to announcement recently, leaving outstanding a balance of $105,797,989. The loans have been made to railroads, public utilities, industries and cattle growers. Although the corporation has authority to issue $1,000,000,000 in bonds for the financing of export trade it is not expected that any advances for this purpose will be made before the conclusion of peace.

Hurley Machine Plans Capital Increase.

Bonbright & Co., Inc., Chicago, and J. G. White & Co., New York City, are offering $1,500,000 three-year 7% gold notes of the Manila Electric Railroad & Lighting Corp. at 98½ and accrued interest. The notes are dated Sept. 1, 1919, and mature Sept. 1, 1922. The proceeds of this issue will be used for additions and improvements made necessary by the steady growth of the business. A sinking fund equal to 12½% per annum of the authorized amount of this issue must, during the life of these notes, be expended either for betterments and improvements to the property or used to retire notes by purchase in the market at not exceeding the redemption price or to redeem the same. These notes are a direct obligation of the company and are issued under a trust indenture by which the company covenants that while any of these notes are outstanding none of its subsidiaries shall create any new mortgage and that no new mortgage other than purchase money mortgages shall be created on any of the company's property without equally and ratably securing this issue. They are followed by $6,000,000 common stock which has paid dividends regularly since 1906 and since 1911 at the present rate of 6% or more per annum. The company during this period has also appropriated out of earnings $1,232,000 for replacements and renewals, and in addition has built up a surplus of $1,914,251, a total of $3,146,251. The corporation through its subsidiaries furnishes the entire electric light and power and railway service to the city of Manila and its environs in the Philippine Islands, having a total population of about 350,000. Average net earnings for the past ten years have been equal to over two and one-third times all interest charges including interest on these notes. For 1918 they were in excess of three and one-third times all interest charges. For 1918 65.5% net earnings were derived from the sale of electricity for light and power and 32.5% from the street railway service.

Railway & Light Reports Profits.

The reports for the year ended July 31, 1919, of the Railway & Light Securities Co. places the total profits at $286,095, profit from income $152,783, total income $178,760, and a surplus after dividends of $28,760.

The balance sheet as of July 31, 1919, shows cash on hand for redemption of collateral trust 5% bonds, $175,154; cash not including funds for redemption of collateral trust 5% bonds, $17,988; notes receivable, $165,348; surplus, $629,202; and total assets and liabilities, $3,657,241.

Western Power Placed on Six Per Cent Basis.

The Western Power Corp. has declared a dividend of 1½% on the preferred stock, placing the stock on a 6% annual basis, payable Oct. 15 to stock of record Sept. 30. Preferred dividends have been at the rate of 4% annually, with 2% a year being added to accrued dividends. There is now 12¾% in back dividends due on the stock.

Southern Traction of Illinois Sold.

Federal Judge English at Urbana, Ill., has approved the sale at public auction of the Southern Traction Co. of Illinois for $400,000. The purchaser, H. D. Mepham of New York, original promoter of the road, was instructed to pay the balance of the purchase price on or before Oct. 10.

Willys Corporation Expansion.

It has been announced that the new Willys Corp. will be in effect a combination to permit expansion of the Electric Auto-Lite Corp. of New York, the New Process Gear Corp. of New Jersey, and the Duesenberg Motors Corp. of New Jersey. The Willy Corp. will be capitalized

For the Readjustment Period—What?

LIII.

An Honest Day's Work

All over the world agitators are calling on labor to demand more wages and at the same time give less work; and, in too many cases, groups of labor listen to the call. Here and there—perhaps—are isolated instances in which the double claim can be and should be granted; instances in which the laborer has been both overworked and underpaid. But in the enormous majority of cases, better wages are possible only through increased production, and the agitator who is blind to this basic truth is leading his followers into a bog.

The crying need of the world is more goods to take the place of those destroyed in war or used without replacement while labor was diverted to military needs. Anything which interferes with this increased output of goods helps to keep the world poor and the cost of living high. If such conditions prevail for any length of time, labor is bound to suffer with the rest of the community. No tightness of organization, no skill in collective bargaining can long make up for the shortage of supplies. Wealth must be created before it can be distributed. To practice restriction of output as a means of getting more wages is counting chickens before they are hatched—AND THEN BREAKING THE EGGS.

"An honest day's work for an honest day's wage." The old slogan does not cover everything, but its teaching can not be neglected without disaster.

When Charles M. Schwab says that if the world would get back to the practice of giving an honest day's work for an honest day's wages, the high cost of living would solve itself, he has put his finger on one of the most crying evils of present day industry. How to *effect* the needed improvement is, however, a serious problem. Up to date no one seems to have solved it.

C. A. TUPPER *President*
INTERNATIONAL TRADE PRESS, INC., CHICAGO

at $15,000,000 8% cumulative first preferred stock, $10,000,000 7% cumulative second preferred, and 5,000,000 shares of common stock of no par value. The companies acquired and securities owned in several other corporations, together with other assets, are reported to indicate a value of about $25,000,000 for the common stock over and above the first and second preferred stocks.

Dividends.

Detroit Edison Co. has declared a quarterly dividend of 2%, payable Oct. 15 to stock of record Sept. 30.

A cash dividend of $2 per share has been declared by the American Telephone & Telegraph Co., payable Oct. 15 to stock of record Sept. 29.

Manufacturers' Light & Heat Co. has declared a quarterly dividend of 2%, payable Oct. 15 to stock of record Sept. 30.

The board of directors of the Montreal Telephone Co. has declared a quarterly dividend of 2%, payable Oct. 15 to stock of record Sept. 3.

Electric Securities Corp. has declared a quarterly dividend of 2%, payable Oct. 1 to stockholders of record Sept. 27; also a quarterly dividend of 1¼% on preferred stock, payable Nov. 1.

Western Power Corp. has declared a quarterly dividend of 16% on preferred stock, payable Oct. 15 to stock of record Sept. 30.

Directors of the Westinghouse Electric & Manufacturing Co. have declared a quarterly dividend of 2%, payable Oct. 31 to stock of record Oct. 3; also a quarterly dividend of 2% on preferred stock, payable Oct. 15 to stock of record Oct. 3.

Central Illinois Public Service Co. has declared a quarterly dividend of 1½% on preferred stock, payable Oct. 15 to stockholders of record Sept. 30.

Commonwealth Edison Co. has declared a quarterly dividend of 2%, payable Nov. 1 to stockholders of record Oct. 15.

American Power & Light Co. has declared a quarterly dividend of 1½% on preferred stock, payable Oct. 1 to stock of record Sept. 20.

Pacific Telephone & Telegraph Co. has declared a quarterly dividend of 1½% on preferred stock, payable Oct. 15 to stock of record Sept. 30.

United Light & Railways Co. has declared a quarterly dividend of 1%, also a quarterly dividend of 1½% on preferred stock, both payable Oct. 1 to stock of record Sept. 15.

Earnings.

CHICAGO, NORTH SHORE & MILWAUKEE ELECTRIC.

For the 12 months ending June 30, 1919: Total operating revenue, $3,252,846, increase $1,103,084; net after taxes, $895,013, increase $280,744; total net income available for interest charges, depreciation, etc., $906,873, increase $286,925.

NORTHERN STATES POWER CO.

Earnings of the Northern States Power Co. and subsidiaries for the month of July and the year ended July 31, compared with the corresponding periods of last year, are as follows:

Month of July:	1919.	1918.
Gross earnings	$ 714,122	$ 612,644
Net earnings	305,500	285,063
Year ended July 31:		
Gross earnings	9,314,402	7,721,884
Net earnings	3,997,134	3,265,883

CITIES SERVICE CO.

July gross, $1,583,722, decrease $205,531; net, $1,526,765, decrease $227,528; balance after interest, $1,349,937, decrease $397,294; surplus after preferred dividends, $996,758, decrease $413,964.

COLUMBIA GAS & ELECTRIC.

Consolidated earnings and expenses for August:

Gross earnings	$ 804,071
Net operating earnings	344,281
Surplus	110,750
Eight months—	
Gross earnings	7,709,114
Net operating earnings	3,801,033
Surplus	2,059,585

GREAT WESTERN POWER.

July gross, $451,535, increase $38,415; net after taxes, $239,451, increase $2967; surplus after charges, $97,276, decrease $9889; accrued dividends on California Electric Generating Company preferred stock, $12,500; reserve for depreciation, $30,000; surplus for period, $54,776, decrease $9889.

REPUBLIC RAILWAY & LIGHT.

June—	1919.
Gross earnings	$ 474,763
Net income	31,900
Balance after preferred dividend.	5,943
Six months—	
Gross earnings	3,006,037
Net income	202,093
Balance after preferred dividend.	46,351

STANDARD GAS & ELECTRIC CO.

Combined earnings of all Standard Gas & Electric Co. utilities for the month of July and year ended July 31, compared with corresponding previous periods are reported as follows:

July:	1919.	1918.
Gross earnings	$1,945,352	$1,724,802
Net earnings	684,577	653,283
Year ended July 31:		
Gross earnings	25,850,255	21,368,873
Net earnings	9,514,028	8,611,068

PENNSYLVANIA UTILITIES SYSTEM.

For August—	1919.
Operating revenues	$145,635
Operating expenses and taxes	97,073
Operating income	48,561

NATIONAL CONDUIT & CABLE.

Estimated income account for the six months ended June 30:

	1919.	1918.
Net sales	$4,760,150	$6,628,684
Mfg. costs, etc.	5,156,946	6,703,790
Total def. for period	64,256	.....

NEVADA-CALIFORNIA ELECTRIC CORP.

Gross earnings:	1919.	1918.
July	$ 269,519	$ 211,602
7 months	1,500,976	1,285,687
Net earnings:		
July	152,356	86,214
7 months	829,578	652,916

MISSISSIPPI RIVER POWER.

Gross earnings:	1919.	1918.
July	$ 196,693	$ 191,147
12 months	2,237,793	2,137,303
Net earnings:		
July	156,684	151,596
12 months	1,747,651	1,717,742

NORTHERN OHIO ELECTRIC CORP.

Gross earnings:	1919.	1918.
July	$ 803,251	$ 632,025
7 months	5,116,185	4,100,354
12 months	8,309,662	6,884,836
Net earnings:		
July	266,006	215,564
7 months	1,739,025	1,458,165
12 months	2,760,628	2,459,290

THE DAYTON POWER & LIGHT CO.

	July,		Seven months ended July 31,		Twelve months ended July 31,	
	1919.	1918.	1919.	1918.	1919.	1918.
Gross earnings	$202,835	$175,829	$1,614,626	$1,297,157	$2,748,198	$2,149,612
Operating expenses (including depreciation and taxes)	136,317	120,290	1,021,332	914,903	1,768,381	1,482,734
Net earnings	$ 66,518	$ 55,539	$ 593,294	$ 382,254	$ 979,817	$ 666,878
Non-operating revenue	3,795	4,012	19,956	18,416	34,842	23,737
Total income	$ 70,313	$ 59,551	$ 613,250	$ 400,670	$1,014,659	$ 690,615
Interest on bonds	$ 32,113	$ 32,192	$ 224,992	$ 192,552	$ 385,951	$ 268,156
Other deductions (including other interest and sinking fund).	18,817	11,497	80,815	82,001	145,467	134,805
Total deductions	$ 50,930	$ 43,689	$ 305,807	$ 274,553	$ 531,418	$ 402,961
Net income	$ 19,383	$ 15,862	$ 307,443	$ 126,117	$ 483,241	$ 287,654
Dividends on preferred stock	16,255	14,848	109,822	103,723	185,651	177,786
Surplus	$ 3,128	$ 1,014	$ 197,621	$ 22,394	$ 297,590	$ 109,868
Operating ratio	67.21%	68.41%	63.24%	70.48%	64.34%	68.96%

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Sept. 23.	Bid Sept. 30.
Adirondack Electric Power of Glens Falls, common	6	14	14
Adirondack Electric Power of Glens Falls, preferred	6	77	77
American Gas & Electric of New York, common	10+extra	118	118
American Gas & Electric of New York, preferred	6	40	40
American Light & Traction of New York, common	..	225	215
American Light & Traction of New York, preferred	6	94	94
American Power & Light of New York, common	4	..	..
American Power & Light of New York, preferred	6	..	..
American Public Utilities of Grand Rapids, common	..	5	5
American Public Utilities of Grand Rapids, preferred	7	20	25
American Telephone & Telegraph of New York	..	101½	99½
American Water Works & Elec. of New York, common	..	5	5
American Water Works & Elec. of New York, particip	7	10	10
American Water Works & Elec. of New York, first preferred	..	57	59
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	22	21
Cities Service of New York, common	+extra	487	483
Cities Service of New York, preferred	6	77	77
Commonwealth Edison of Chicago	8	107¼	107
Comm. Power, Railway & Light of Jackson, common	..	23	20
Comm. Power, Railway & Light of Jackson, preferred	6	50	49
Federal Light & Traction of New York, common	..	9	7
Federal Light & Traction of New York, preferred	..	47	47
Illinois Northern Utilities of Dixon	6	75	75
Middle West Utilities of Chicago, common	..	30	30
Middle West Utilities of Chicago, preferred	..	50	50
Northern States Power of Chicago, common	..	65	65
Northern States Power of Chicago, preferred	ex.div.7	90	90
Pacific Gas & Electric of San Francisco, common	..	67½	68
Pacific Gas & Electric of San Francisco, preferred	6	88	88
Public Service of Northern Illinois, Chicago, common	7	85	85
Public Service of Northern Illinois, Chicago, preferred	6	87	87
Republic Railway & Light of Youngstown, common	4	12	11
Republic Railway & Light of Youngstown, preferred	6	48	47
Standard Gas & Electric of Chicago, common	..	32½	31
Standard Gas & Electric of Chicago, preferred	8	41	41
Tennessee Railway, Light & Power of Chattanooga, common	..	5	5
Tennessee Railway, Light & Power of Chattanooga, preferred	6	13	13
United Light & Railways of Grand Rapids, common	4	41	43
United Light & Railways of Grand Rapids, preferred	6	70	70
Western Power of San Francisco, common	..	24	24
Western Union Telegraph of New York	extra	85½	83
Industries.			
Electric Storage of Philadelphia, common	4	97	98
General Electric of Schenectady	8	164	164
Westinghouse Electric & Mfg. of Pittsburgh, common	7	54⅛	54¾